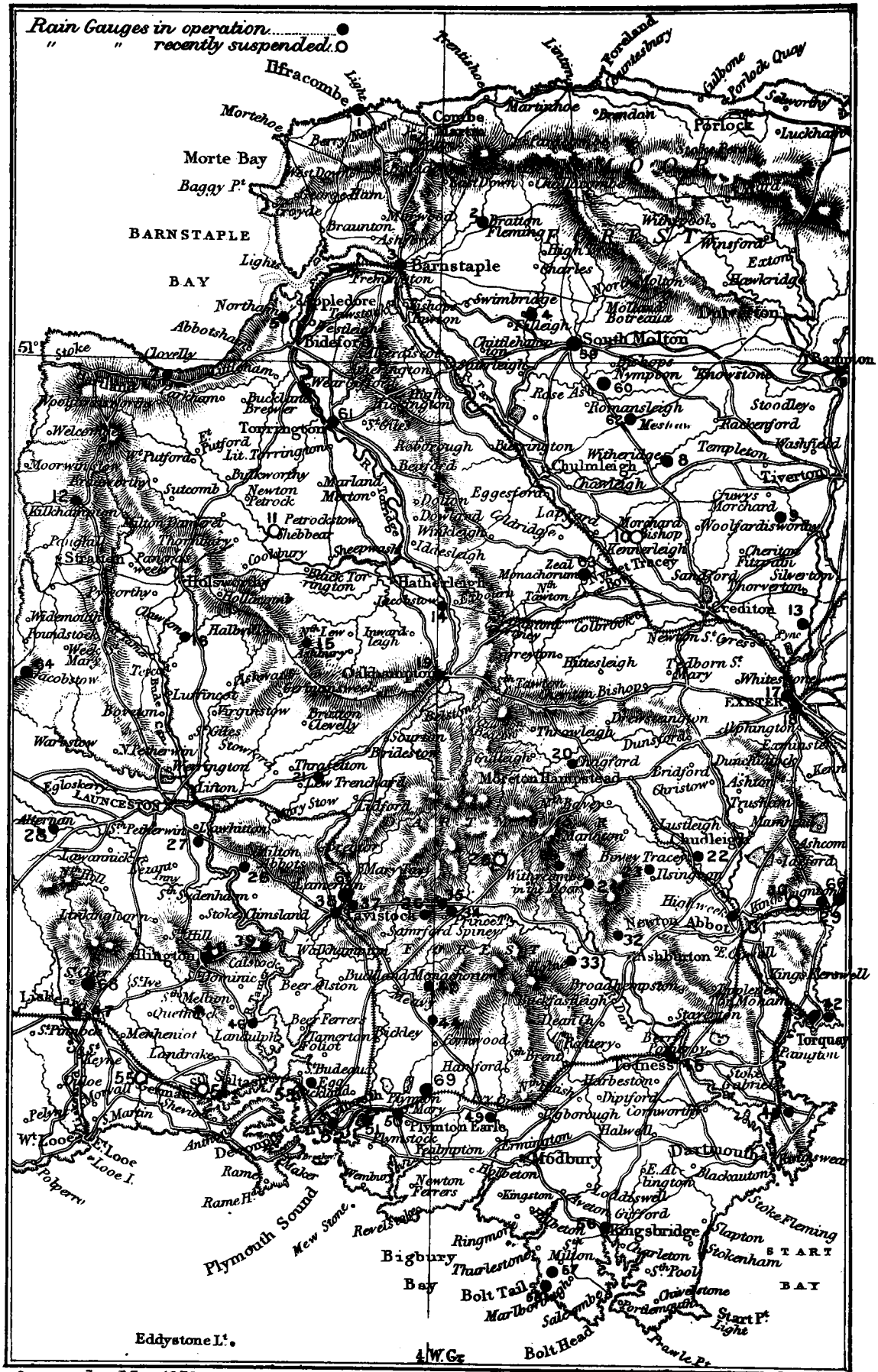
RAIN GAUGE STATIONS IN PARTS OF DEVON AND CORNWALL.


Rain Gauges in operation
" " recently suspended
Ilfracombe
Morte Bay
BARNSTAPLE
BAY
Barnstaple
Bideford
Torrington
Holsworthy
Okehampton
Launceston
Tavistock
Plymouth
Plymouth Sound
Bigbury
Bay
Bolt Tail
Bolt Head
Start Bay
Start Pt.
Eddystone L.t
Dartmouth
Totnes
Kingsbridge
Modbury
Ivybridge
Plympton
Newton Abbot
Torquay
Brixham
Exeter
Tiverton
Crediton
South Molton
Chulmleigh
Witheridge
Hatherleigh
Lifton
Launceston
Callington
Liskeard
Looe
Polperro
Fowey
Mevagissey
St Austell
Truro
Falmouth
Helston
Penzance
Newlyn
Porthleven
Lizard Point
Lizard Light
Manacles
Start Point Light
Prawle Point
Salcombe
Kingsbridge
Dodbrooke
Thurlestone
Bolt Tail Light
Marlborough Head
Portsmouth
Chivelstone
Stokenham
Slapton
Stoke Fleming
Blackawton
Strete
Dittisham
Stoke Gabriel
Totnes
Harbertonford
Diptford
Ugborough
Cornworthy
Halwell
Ermington
Yealmpton
Plympton Earle
Plymstock
Egg Buckland
Plymouth
Mutley
Mannamead
Stoke
Devonport
Keyham
Millbrook
Torpoint
Antony
Sheviock
Maker
Rame
Rame Head
Looe
Looe I.
Polperro
Pelynt
Lanreath
Duloe
Morval
Lansallos
Lanteglos
Pelynt
Talland
Polruan
Lerryn
Lostwithiel
Fowey
Par
St Blazey
Mevagissey
Gorran
Tregony
Truro
Perranporth
Newquay
Padstow
Wadebridge
Camelford
Boscastle
Tintagel
Bude
Stratton
Launceston
Lifton
Tavistock
Okehampton
Hatherleigh
Holsworthy
Torrington
Bideford
Barnstaple
Ilfracombe
Combe Martin
Lynton
Lynmouth
Foreland Point
Porlock
Minehead
Dunster
Watchet
Williton
Taunton
Wellington
Tiverton
Cullompton
Honiton
Axminster
Lyme Regis
Sidmouth
Budleigh Salterton
Exmouth
Dawlish
Teignmouth
Newton Abbot
Totnes
Kingsbridge
Dartmouth
Brixham
Torquay
Paignton
Exeter
Crediton
Okehampton
Tavistock
Launceston
Bude
Stratton
Clovelly
Hartland
Hartland Point
Lundy
Lundy Island
Eddystone L.t
Bolt Head

BRITISH RAINFALL, 1871.

ON

THE DISTRIBUTION OF RAIN

OVER THE

BRITISH ISLES,

DURING THE YEAR

1871,

AS OBSERVED AT ABOUT 1500 STATIONS IN GREAT BRITAIN AND IRELAND,

WITH REMARKS ON VARIOUS EXPERIMENTS, MAPS, AND NUMEROUS ILLUSTRATIONS.

COMPILED BY

G. J. SYMONS, F.M.S., F.R.B.S.,

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LONDON:

EDWARD STANFORD, CHARING CROSS, S.W.

SIMPKIN, MARSHALL & Co., STATIONER'S HALL COURT.

1872.

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NOTE.

The Author being very anxious to make these Tables as complete as possible, will be obliged by information of, or from, any persons who record the fall of rain in the British Isles, but who have not hitherto communicated their observations to him. He also desires to be informed of any registers of the fall in previous years, however remote the place or period of observation, or however long discontinued.

ERRATA IN "BRITISH RAINFALL," 1870.

Page 28.—Line 21, *for* × *read* +.
,, 28.— ,, 27, *for* × *read* +.
,, 45.— ,, 3, should read "a greater angle such as 50° or even 60°".
,, 56.— ,, 19, strike out the word inches.
,, 64.— ,, last, *for* 1865 *read* 1870.
,, 118.— ,, 11, *for* Llanwrytydd *read* Llanwrtydd.

There is not a single misprint in the whole of the general tables, but the return from Div. X., St. Bees, Cumberland, seems too low, and that from Div. XV., Sound of Mull, Argyll, is decidedly erroneous.

BRITISH RAINFALL, 1871.

For the first and, I hope, the last time, I pen the preface to my annual statement in the month of May, and send it forth more than two months later than in any previous year. This is due to two causes, or rather to two modifications of one cause: it is due to illness, which I suppose I must acknowledge to have been partially the result of overwork, and it is due to the development of the work itself.

There are two important respects in which the present volume differs from the previous ones, which ought not to be passed over in silence. One is, that the General Tables, which contain returns from 1500 stations, are now almost exclusively compiled from detailed returns of the rainfall on every day in the year. Taking the number of days with rain at 150, nearly a quarter of a million entries have been checked prior to the formation of these tables alone. The other alteration is, that the space devoted to the "Meteorology of the Year" and "Observers' Notes" is increased threefold. This I have done in order to supply not merely full details of the rainfall, but also of concurrent phenomena.

During my illness, offers of assistance in preparing these pages were most flatteringly numerous, and I am indebted to several friends for welcome aid, and especially to Mr. E. M. Eaton, of Sheffield, whose accuracy was only equalled by his kindness. Voluntary aid has however its limits, and I am anxious to secure a permanent assistant. I have written more fully on this subject on page 203, and simply draw attention to it here as probably the only means of ensuring the maintenance of the present organization.

G. J. SYMONS.

62, Camden Square, N.W.,
May 24th, 1872.

REPORT.

WITH the gradual but continuous increase in the number of stations whence rain returns are received, and the almost universally increased completeness of the observers' reports, my duties as Editor have become so onerous as to occupy nearly the whole of my time with what may be called routine work. The general character of this work may be gathered from the Report in *British Rainfall*, 1869. There are many ways in which this may be diminished, and I hope the large majority of observers, who do everything I could wish, will not consider I am referring to them or to any one person in the following remarks, which are quite impersonal, and only designed to secure accuracy and save time. I am fully aware that it is a mere matter of courtesy to send me returns at all, but that very fact seems to me to render it incumbent on the senders to comply, as far as possible, with requests submitted to them. The main sources of delay are (1) indistinct figures; (2) misplaced or omitted cyphers; (3) false casting; (4) delay in forwarding returns; (5) removals, and discontinuance of observations without reporting the same. All these are preventible except the last, and it is also, except in the case of the observer's death, and even then I am glad to state that it is becoming a general practice for the relatives to forward an intimation of the fact. Notice of removals and interruption of observations, is of the very highest importance, and should, whenever it is possible, precede the actual stoppage, so that steps may be taken to obtain another observer in the neighbourhood. And here I may suggest that usually the observer himself is the best able to obtain a successor. Those who appreciate the high value of long series of observations will perhaps take this as a hint, and as far as practicable take care that a substitute is in training.

Inquiry after other observers in the neighbourhood.—This is another mode in which my correspondents may materially help. I am continually coming, in the middle of a long note, upon such a remark as,

"my neighbour, Mr. ——, registered ·78 in the same shower." This shows that Mr. —— is observing, and then, perhaps, it turns out that Mr. —— has been a regular observer for twenty or thirty years, sends me a copy of all his records, and proves one of my best helpers. This is a satisfactory result, but it is only by sharply noting the casual remark that it was achieved; and then after thrice the correspondence which would have been required had my original communicant either asked his neighbour to write direct to me, or himself sent me Mr. ——'s name and address.

The Preservation of original Observation Books is another very important matter; those of a great many deceased observers have been sent to me, and are most carefully preserved, but sadly too often they are for a few years jealously treasured as family relics, then they get dusty and are put aside, and finally are either burned or sold for waste paper. This, I have reason to believe, was the fate of the earliest English rain records, and it has, I know, been that of hundreds of yearly returns from the earliest to the present day. On these records turns the national (for such it really is) question of the secular variation of rainfall. Can they, therefore, be too eagerly sought after, or too carefully preserved?

Search for Rainfall Statistics in Country Newspapers.—It seems evident that no diminution in the present staff of observers must be allowed if adequate data for engineering purposes are to be available; and if so it seems improbable that either I or my assistant will have time to search the files of country newspapers in the British Museum within any reasonable number of years. Mr. Sawyer has, I believe, done this for Brighton; it would be a great relief to me if I could hear that other gentlemen followed his example, and would similarly search their county papers. I would gladly render any assistance in my power, and judging by my own experience, I believe they will be well rewarded; and if not, in this, as in so many other matters, negative evidence is very useful. If Mr. A. B. sent word that he had "searched the —— *Mercury* from the first volume to the last, and found no rain returns," I should know that it was unnecessary for me to repeat the search; but, as I have said, I believe that a file of a county paper without rain returns is a rarity.

Improved Geographical Distribution of Stations—The progress in this very important branch has, I think, been greater than for several

years past. Before stating the principal new stations secured, I think it may be as well to quote an illustration (an extreme one I admit) of the necessity for being constantly on the alert to keep up an efficient corps. To make the case quite plain and intelligible I will put it in a simple tabular form, denoting by the letter R that a complete return from the station and for the year opposite and under which it is placed has been received :—

CARMARTHENSHIRE.

Stations.	1859.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.
Rhydwen	R	R	R	R	R	R	R	R	R	R	...	...	...
Carmarthen Gaol	...	...	..	...	R	R	R	R	R	R	R	R	R
,, (Mr. Rowlands)	...	...	...	...	...	R	...	...	...	...	...	...	...
,, (Plas Cwrt Hyr)	..	...	..	...	...	R	R	R	R	R	R	R	...
Llanelly	..	...	...	...	...	...	R	..	R	R	R	R	...
Pembrey (Burry Port)	...	.	...	...	...	...		R	..	...	...	...	...
Llanstephane	..	...	...		...	..	...	R	R	R	R	.	...
Llanelly (West End Terrace)	...	...	...	...	...	..	...	...	R	R	R	R	...
Carmarthen (Joint Counties Asylum)	...	...	...	...	...	...	...	...	...	...	R	R	R
Llandeilo Fawr	..	...	..	...	...	...	...	...	...	...	R	.	...
Narberth (Tegfynydd)	...	...	...	...	...	...	...	...	...	...	R	R	R
Llangadock	...	...	..	...	...	...	...	...	...	...	.	R	R

The observer has removed from Llangadock since the end of the year 1871, therefore it will be seen that in two years the Carmarthenshire observers have decreased from eight to three, and that not one register goes back even ten years. Analyzing the causes of interruption I find one death, five removals, and three "could not secure regularity of observation." Four of these interruptions occurred during 1871, and yet not one word of notice was sent to me, consequently I took no steps to obtain substitutes, and the county is left for two years (1871–72) with only three stations, two of which are close together. I said that this was an extreme illustration, but the same on a lesser scale is constantly occurring, and thus I am compelled to ask for more observers than would otherwise be necessary. It is only by keeping up a reserve that such collapses as the one above quoted can be guarded against, and it is only or mainly by the help of my present correspondents that others can be obtained. Hitherto I have been most cordially helped, and I have, therefore, no doubt as to the future, but as the expansion and consolidation of our system of observation becomes yearly more generally known, the demand for ample particulars for all kinds of purposes increases, and it behoves both my correspon-

dents and myself to keep not only up to, but in advance of, the requirements of the day,—and first to obtain some fresh stations in Carmarthenshire.

New Stations.—This title may be held to include three distinct groups of stations, all of which fulfil the primary condition of not having been previously announced in these pages. The groups are—(1) Stations only new in the one respect that they have not previously been inserted in this publication; (2) Stations not previously announced, but started in or about December, 1870, and at which complete records exist for 1871; (3) Stations started during 1871. The first group includes the small (but always welcome) number of stations at which observations have been made for some years, but of which I was unaware, or from which I have not been favoured with returns. Two instances of this kind will sufficiently illustrate this. There has always been a deficiency of observers in the county of Buckingham; quite recently observations were offered from Addington Manor, Winslow, the very spot where they were most required, and, on further correspondence, it appears that observations have been regularly taken during 1870 and 1871. Another district whence observations are much required is West Inverness, and almost every step which could be suggested has been tried in order to ascertain if there were any observers besides those already contributing returns, or if there were any persons who would look after gauges if provided with them gratuitously; but all letters to the local newspapers, circulars, and enquiries seemed in vain, when, I presume, equally to Mr. Buchan's astonishment and pleasure, he received a complete return from one of the most useful localities which could have been selected, viz., Glenfinnan, Loch Sheil, from May, 1867, to the present time.

The second class includes stations not previously announced, and of which 1871 is the first year of observation. Among the more important of these, are The Denbies, on the crest of the hill above Dorking, Surrey; Goldstone Bottom, Brighton; Crowborough Beacon Observatory, on nearly the highest hill in Sussex, and 777 feet above sea level; Barking, Essex; Diss, and also Halvergate Hall, in Norfolk (the latter will henceforth take away the reproach that the tables contain no returns from the vicinity of Yarmouth); Radway and Bickenhill, two useful stations in Warwickshire; those in Derbyshire are mentioned elsewhere. Then there are quite a group in the North Riding of Yorkshire, and one each in Brecon (Watton Mount), Pembroke (Ivy Tower,

Tenby), and Denbigh (Nant-y-Frith). In Scotland, the more important are Rockville, Linlithgow, for which county no observations have been published for some years; Oban and Glenborrodale, Argyllshire; Rothiemay and Tomintoul, Banff; and Sligachan, Skye (the establishment of this was, I think, mentioned last year, but its importance probably excuses repetition). From Ireland there is only one new return, but it is of the greatest importance, viz., from Darrynane Abbey, on the south-west point of Ireland, at the estuary of Kenmare river.

The third group consists of stations started during 1871, and whence returns may be expected in our next. This list is unusually long and important, but it will probably be sufficient to indicate the principal groups, and leave precise details until the observations have been received. Running rapidly over the list, the following may be selected for notice :—A new gauge supplied to the old station of St. Agnes, Cornwall, and new stations started at Jacobstowe and Bude, in the north of that county; our old correspondent at Wisbeach, Mr. S. H. Miller, F.R.A.S., has, at the request of the Mid-level Commissioners, superintended the placing of a set of gauges between Peterborough, Chatteris, and King's Lynn; new stations have been started at Hornsea, Yorkshire, two in Westmoreland, and one at Corwen.

The principal increase has, however, been in Scotland, where the deficiency was, and still is, much greater than in England. Through the kind assistance of Mr. Buchan, the secretary of the Scottish Meteorological Society, observers have been found for several British Association gauges in Arran, Islay, and other parts of the West Coast. The Earl of Breadalbane (through Mr. J. P. Smith, C.E.) has started gauges in various parts of his estates, extending from Aberfeldy on the east, to the important old station (long abandoned) of Tyndrum, on the west; and, though last by no means least, the Directors of the Highland and Dingwall and Skye railways have, through their secretary, Mr. Dougall, agreed to observations being taken by a large number of the station masters along their beautiful line; the stations extending from Dunkeld to Helmsdale, 230 miles from N. to S., and with branches to Strome Ferry on the west, and to Keith on the east, a breadth of 100 miles.

With these valuable accessions, the prospect of accurate knowledge of the strange peculiarities of Scottish Rainfall will be greatly improved, but a still further development is required, especially along the Caledonian Canal, on the West Coast, in Lewis, and in Skye.

Mean Monthly per-centage of Annual Fall, 1860–69.—The first stage of this inquiry is now completed, the average fall at each of more than three hundred stations for each month of the year, has been computed from the returns for the decade 1860–69. They are, therefore, ready for converting into per-centages and for discussion. I hope that this may be accomplished during 1872, but there are several routine matters claiming priority, and it is therefore by no means certain that it can be done.

Altitude above Sea Level.—Having devoted an article to this subject in *British Rainfall*, 1870, I have only to chronicle the progress during the past year. The offer made in that article not being generally accepted, perhaps not noticed, the projected series of barometric levelling was not carried out. The Ordnance department are now progressing so rapidly with their levelling that I hope my correspondents will soon all be able to connect their gauges directly with Ordnance datum, and thus entitle their reports to the symbol (⅄) indicative of the fact that they may be implicitly relied upon. I am glad to notice that the number of stations thus distinguished is considerably greater this year than in 1870, and shall gladly assist in increasing the number in any way that I can.

Self-recording Evaporator.—It will be remembered that the principal evaporator at Strathfield Turgiss is a tank having a superficial area of 36 sq. ft. Mr. Field and I agreed that it was absolutely necessary to attach to it self-recording apparatus to show every alteration in the level of the water, and we further decided that the apparatus must be sufficiently delicate to show 0·02 in., or, if possible, 0·01 in. How utterly useless all previously designed apparatus proved, how many futile attempts we made will, I suppose, never be stated, but at last we succeeded, as Mr. Field will shortly describe. Although these experiments, and the subsequent fixing of the apparatus occupied a very long time, I have no doubt that when the curves are fully discussed it will prove that from a scientific point of view the time was very wisely and well spent.

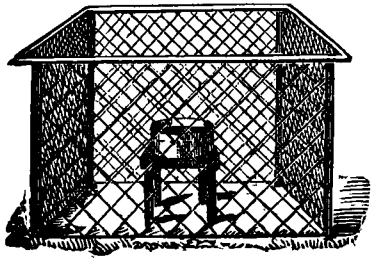
Evaporation.—As this subject has almost entirely passed out of my hands and into those of Mr. Rogers Field, I have not thought it worth while to form my notes upon it into an Appendix, as in two previous years, and therefore proceed to lay before my readers the information with which I have been favoured respecting 1871.

County ...	Cambridge.				Lancashire.			Forfar.	Aberdeen.	Antrim.
Station ...	Wisbeach.				Heaton Chapel.	Bolton.	South Shore.	Barry.	Aberdeen.	Carrickfergus.
Observer ...	S. H. Miller, Esq.				J. Curtis, Esq.	H. H. Watson, Esq.	G. Sharples, Esq.	Mr. Proctor.	Rev. A. Beverley.	A. Sutherland, Esq.
Reference	A.	B.	C.	D.	L.	E.	F.	I.	K.	M.
January.	·17	·17	·15	·06	·84	·17	·50	1·45	·62	...
February	·46	·36	·37	·28	1·25	·60	·48	1·95	1·03	...
March ...	1·01	·85	1·04	·81	2·73	1·34	2·00	4·80	2·07	...
April ...	1·30	·76	·65	1·01	2·45	1·41	2·40	2·85	2·34	...
May.....	2·34	1·24	1·18	2·05	3·32	2·74	4·45	3·60	3·13	...
June.....	1·80	·85	·73	1·63	2·76	2·53	3·25	3·55	3·27	...
July.....	2·52	1·15	1·09	2·05	3·44	2·34	4·23	1·85	3·21	5·04
August...	2·53	1·31	1·13	2·44	4·22	3·11	4·59	2·70	2·52	8·17
Sept.....	·97	·62	·50	·80	2·92	2·90	2·60	3·10	2·03	2·77
Oct.	1·00	·49	·38	·90	1·62	·80	1·10	2·40	1·17	3·09
Nov	·12	·22	·18	·08	1·22	·35	·50	2·60	·55	2·60
Dec.....	·08	·22	·17	·07	·62	·23	·35	3·65	·62	1·85
Totals.	14·30	8·24	7·57	12·18	27·39	18·52	26·45	34·50	22·56	...

Reference.	Diameter.	Height above ground.	REMARKS.
A. ...	8 in. ...	0 ft. 4 in. ...	Described and figured on page 178 *British Rainfall*, 1870. Consists of a shallow tin vessel of water immersed in a larger one of wet sand.
B ...	8 in. ...	6 ft. 0 in. ..	Placed under a stand protected from sun and rain.
C. ...	8 in. ...	0 ft. 4 in. ...	Similar to A, except that it is protected from sun and rain by a white board on posts.
D. ...	8 in. ...	0 ft. 0 in. ...	Stands in a large vessel holding 8 gallons of water, which is kept nearly level with that in the inner one.
E. ...	10 in. ...	3 ft. 6 in. ...	Described and figured on page 182 *British Rainfall*, 1870.
F. ...	.. .	1 ft. 8 in. ...	In a large tub of earth, partly buried in the ground.—See *British Rainfall*, 1869, p. 173
I. ...	10 in. sq.	3 ft. 0 in. ...	A zinc box, about four inches deep, standing on a dwarf stool.—[See figure 21, p. 180.]
K. ...	5 in. ...	0 ft. 0 in. ...	Zinc cylinder with overflow arrangement.—[See *British Rainfall*, 1869, p. 163.]
L. ...	8 in. ...	1 ft. 0 in. ...	See next page.
M. ...	8 in. ...	1 ft. 0 in. ...	Zinc cylinder 8 inches deep, felt protected one inch thick, set on a dwarf stool. Read by brass scale engine divided to 0·01 inch.

Evaporation in the neighbourhood of Manchester.

	Old Trafford.														Heaton Chapel.	
Year...	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Jan. ...	·38	·62	·73	·92	·68	·97	·96	·72	1·07	·95	1·05	·73	1·02	1·08	·67	·84
Feb. ...	·68	·64	1·14	·79	1·03	1·29	1·23	1·08	1·35	1·09	1·17	·95	1·15	1·51	1·07	1·25
March.	1·43	1·24	1·41	1·40	1·05	+2·90	1·61	1·83	2·35	1·39	2·05	2·43	1·72	1·52	1·50	2·73
April..	1·77	1·58	1·88	1·75	+2·25	2·43	+2·10	2·27	2·75	2·31	2·47	·77	1·85	2·73	2·66	2·45
May ...	+1·98	2·29	2·42	+3·43	1·60	2·10	1·91	+2·35	3·30	2·11	+2·88	+2·57	3·10	2·45	3·92	3·32
June...	1·88	+3·30	+2·88	2·90	1·20	2·37	1·35	2·32	2·47	+3·02	1·95	1·74	3·25	3·03	3·72	2·76
July ...	1·87	2·26	2·20	1·62	1·89	2·20	1·82	2·09	+3·67	2·47	1·38	1·14	+4·33	+5·02	4·36	3·44
Aug. ..	1·84	1·84	1·97	·93	1·48	2·11	1·92	1·72	2·38	1·74	1·50	2·21	3·67	2·30	5·17	4·22
Sept ...	1·25	1·14	1·46	1·03	1·38	1·51	1·31	1·28	2·05	1·95	·87	1·31	2·88	2·13	3·78	2·92
Oct. ...	·70	·92	1·06	·65	1·30	1·39	1.04	·93	1·76	1·64	1·17	·98	1·03	1·26	1·17	1·62
Nov....	·64	·61	·73	·70	·95	·75	1·19	1·14	·76	1·07	·45	·57	1·11	·91	·72	1·22
Dec....	·57	·63	·61	·39	·78	·79	·94	1·22	·69	·73	·91	·86	·72	·63	·58	·62
Total..	14·99	17·07	18·49	16·51	15·59	20·81	17·38	18·95	24·60	20·47	17·85	16·26	25·83	24·57	29·32	27·39



Evaporator 8½ in. in diameter, 3½ in. deep, ordinary depth of water 3 in.; is 1 ft. above soil, and the enclosure is 2 ft. × 3 ft. In order to maintain about the same height it is filled every few days according to the waste by evaporation, the amount put in is entered each time in a book kept for the purpose, and the total amount (3 in.) first put in is added to what is later put in, and the amount remaining at the end of each month is then deducted from the totals.

J. Curtis.

The only new returns in the above table are those from Heaton Chapel and Carrickfergus. The observer at the latter station is, I believe, extremely accurate and careful, but the amount of evaporation which he reports is surprisingly large. It is most desirable that during the present year he should compare the temperature (in the middle of the day) of the water in his evaporator with that in the nearest lake, pond, river, or large body of water. He does not specify the ordinary depth of water in the evaporator; its whole depth is only eight inches, and it seems probable that the temperature of the water in such a vessel will largely exceed that of any lake, &c., of which of course it is intended to be the representative.* It is not, however, very easy to see in what respect it differs sufficiently from the other new station (Heaton Chapel) to account for the returns from Carrickfergus being nearly double those from Heaton Chapel. Truly, evaporation is a difficult subject!

The only thing which can be done until the results of the experiments at Strathfield Turgiss are published is to compare the results of the same instruments, observed at the same places, by the same observers, in different years. Subjecting the table on page 12 to this examination, we find that the evaporation in 1871 is reported to have been less than that in 1870 at *every* station whence we have returns. The following is the decrease (per cent. of the amount in 1870) :—

Wisbech Evaporator A	10 per cent.
,, ,, B	10 ,, ,,
,, ,, C	26 ,, ,,
,, ,, D	13 ,, ,,
Heaton Chapel, Manchester	7 ,, ,,
Bolton-le-Moors	2 ,, ,,
South Shore, Blackpool	23 ,, ,,
Barry, Forfar	12 ,, ,,
Aberdeen	20 ,, ,,

From this it seems pretty evident that although we are ignorant of the real amount evaporated, an indication of its fluctuation may henceforth be obtained, and that in 1871 the amount evaporated was between 10 and 15 per cent. less than in 1870. Now, the amount of evaporation, even from a natural source, such as a lake, is determined by many causes, the principal of which (1) the relation of the temperature of the water to that of the dew point, and (2) the velocity of the wind

* This subject is discussed at length in *British Rainfall*, 1868, pp. 152—157.

passing over it, are themselves probably due to others, such as (α) the state of the sky as to cloud, and (β) as to invisible vapour, both of which influence solar and terrestrial radiation, (γ) amount of rain, (δ) irregularities of temperature. It does not by any means follow that a year with small rainfall will be one with large evaporation, because the rain, though small in amount, may fall in driblets throughout the summer months, which would involve probably an overcast sky and a somewhat stagnant atmosphere, circumstances which would check, if they did not altogether prevent, evaporation; and however dry the winter months may be, the evaporation at that season could not make up for summer deficiencies. I had intended to close these remarks with the above sentence, but looking over the Old Trafford returns to ascertain which was usually the month of greatest evaporation, I inserted the plus marks as now printed, whence it appears that the greatest amount occurs towards the end of May. It may not be out of place to call attention to the rather symmetrical curve produced by the variation in date of the yearly maximum. I do not attach the slightest weight to it, but if any one wished to construct a theory of cyclical evaporation the table might stand them in good stead.

RAIN GAUGE EXPERIMENTS AT HAWSKER, NEAR WHITBY, YORKSHIRE, 1871.

Lat. 54° 27′ N. ; Long. 0° 34′ W. ; Height above Sea, 428 feet.

By the Rev. F. W. STOW, M.A., F.M.S.

It will not be necessary for me to dwell upon most of the tables which accompany this paper. The observations were carried on as before up to October 20th, in the experimental field. The "Position" series at Ling Hill was continued to the end of April. Some experiments were also made in the paddock adjoining my house to determine the loss by evaporation, with the interesting result that, of two similar 5-inch gauges, 19 inches long, sunk seven inches in the ground, and provided with large earthenware bottles, the one which was read monthly retained during the five summer months rather more than the one which was read daily; while the felt-protected gauge, which was longer than either of the others, and had a glass bottle, caught or retained rather less than either of them. In the "magnitude" series the largest gauge which was provided with a bottle—the 8-inch—had the largest total, and as this was two-thirds inch more than that of the 12-inch, it would appear that a bottle is decidedly preferable to a can. The 8-inch flanged gauge was also provided with a bottle, and the amount caught by it tallies closely with that caught by the other. The observations show, indeed, a gradual increase with the size of the gauge, but the difference is so small that it may well be neglected. Had the exposure not been so good, or had care not been taken to get the mouths of the gauges level after every observation, I doubt whether so small a difference would have shown itself at all clearly.

Although my remarks in last year's *British Rainfall* on the subject of Decrease of Rainfall with Elevation were professedly provisional, owing to the shortness of the time during which the complete observations had been carried on, the subject has since received ample discussion, so far at least as *a priori* reasoning goes, and some light has

thereby been thrown upon it. It will, I think, be conceded that the normal condition of things might be expected to be that the same quantity of rain should fall on the same horizontal surface whatever the change in the obliquity of its fall. This is the law on which so much stress has been laid lately in the pages of the *Meteorological Magazine*. For my own part, I feel much indebted to Dr. Burder for drawing attention to it. But I cannot see that subsequent re-assertions and reiterations have added anything to its certainty. It is a mathematical deduction from unverified hypotheses, and is therefore purely theoretical. As, however, the hypotheses are believed to be approximately true, we may conclude that the law is approximately true also. But this, observe, is a very different thing from saying that it is true in such a sense as to exclude all possibility of interference or exception.

The diagram (Fig. 1), represents pretty exactly the supposed normal

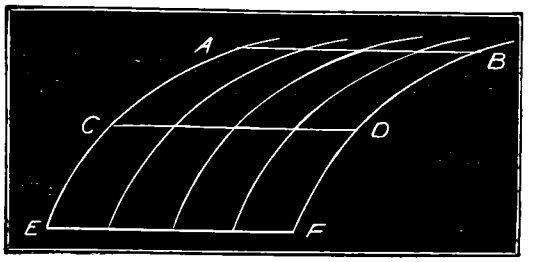


Fig. 1.

condition of things. Suppose A B to represent the mouth of a gauge at 10ft., C D a similar one at 5 ft., and E F another at 1 ft. above the ground, the same rain which strikes A B would, if permitted to proceed, strike C D and E F, and the three gauges would register exactly the same quantity, unless moisture be absorbed by, or abstracted from the air between A B and E F. In the former case A B will of course catch more than E F, in the latter less. It will be observed, that in order that the rain which strikes A B at a greater angle with the vertical, may fall exactly upon E F after the angle is changed—and we know from the experiments that it always is changed—the shortest distance between the paths of the drops must be increased to a certain exact extent, and neither more nor less. Anything which tends to prevent this distance from increasing, will tend to diminish their horizontal distance from one another, and to throw a larger number of drops into E F, which will accordingly catch a greater quantity of rain than the elevated gauge A B. As, however, this additional quantity of rain by which the fall in E F exceeds that in A B, must have passed the level of A B, it follows that the horizontal area of the portion of the shower

which has fallen into E F, must have been greater than that of A B at the higher level. And, therefore, either the area of the whole shower is greater at A B than at E F, or else, the area at each level being the same, the rain is differently distributed, some other part of the ground receiving less than A B, while E F is receiving more. Supposing, then, that we find that in a given month our gauge at E F has received 3 inches of rain, and A B only 2·7 in., what are we to conclude? In good gauges outsplashing and inplashing are, under ordinary circumstances, *nil*, and evaporation imperceptible: besides which, we have arranged that both gauges should be alike in that respect. Our choice seems to lie between these two alternatives. Either the rain in falling has abstracted a quantity of water equal to a fall of ·3 in. out of the air, or some such concentration of the rain as we have contemplated has taken place. The former has been for many years the generally accepted hypothesis. That horn of the dilemma did not, perhaps, look quite comfortable, but it was thought not so formidable as the other. It had the great advantage that it admitted of the mighty forces of heat and electricity being vaguely invoked, and while some talked of the maximum of precipitation being at the surface of the ground (which is only the case when the clouds descend to the ground), others thought that electrical polarization satisfied better the desire for a "great unknown." But as it seems to me, an unanswerable reason against both these may be given in four words: "*Ex nihilo nil fit*," you can't get more out of a thing than there is in it. Suppose the air between A B and E F to have a temperature of 48°—about the mean for England—and the gauges to be 5-inch; then the column of air, 9 feet high, between A B and E F, has a bulk of $1\frac{1}{4}$ cubic feet, and contains, even if saturated with moisture (which is not very often the case near the surface of the ground at ordinary elevations), only 4·7 grains of watery vapour. But to make up our ·3 inch we want no less than 1,488 grains of water. How many times, then, must that air have its moisture all wrung out of it to yield that amount? And as that never takes place in nature, let us look at it in another way. It would require 2,000 separate falls of rain in the month, every one 5° colder than the air, and abstracting in all 10,000° of heat from it within that time. And if the air be supposed not saturated when the rain commenced, but the wet bulb to be 46°, as it generally would be, then 12,000 separate showers, or 400 every day, with the abstraction of 60,000° of heat, would leave the sun little time to raise the temperature between each shower to 48° again! Heat and electricity are

wonderful agents, but I have yet to learn that they can create rain out of nothing.

We come, therefore, to the other supposition. I need hardly recapitulate the causes which have been suggested in the *Magazine* as likely to effect the concentration of the rain-drops near the ground. There is the difference in the height from which they may have fallen, which should affect the result when the thickness of the discharging cloud is altered, as we know it often is. Mr. Pennant thinks that they are brought together by variations of the wind's direction. Then a friend of mine has suggested that, as the wind's horizontal velocity is generally greater than that of the drops, those behind must shelter those in front, and therefore be driven at a greater angle with the vertical. No doubt these causes may, and probably do, throw a larger number of drops into a gauge on the ground, but independently of the doubt whether such concentration of the shower is sufficient to produce the difference observed, I confess that I do not see why, if every shower is smaller near the ground than above it, a gauge on the ground should not have less chance of receiving each individual shower than an elevated gauge, and why, therefore, the elevated gauge should not, in the long run, catch more showers, and the deficiency thus be made up.

Suppose, then, we consider the probability of the rain being unequally distributed, so that while E F receives more than A B, other points in the same horizontal plane receive less. Hitherto we have commonly regarded the wind as a force applied in a horizontal direction, but a little reflection will convince any one that this cannot generally be the case. Indeed the existence of "vertical currents" in the atmosphere has long been recognised, and the British Association considered the subject of such importance, that they endeavoured—though unsuccessfully—to promote their investigation by a grant of money.

But I need only appeal to obvious considerations. The winds, and especially the rain-bearing south and south-west winds, on meeting the coast, are forced up higher and higher, in some cases to the height of 2,000 feet. If after passing this high land the wind maintained a horizontal motion, there would be no more wind near the surface of the ground over the greatest part of the country, than such as might be produced *de novo* by the originating cause of the wind, or than the current moving above could produce by friction against the air lying nearest it, by tearing away, in fact, particle after particle of the quiescent air which would form the bed of the aerial stream, and com-

municating to each its own motion. There is no reason to suppose that this process would within a distance of 100 miles or so produce anything more than a light breeze at the surface of the ground. But although the records of anemometers indicate a much higher velocity on our coasts than inland, there can be no doubt whatever that a considerable portion of the aerial current comes down again. Now what mountains and hills do on a large scale, all obstacles—houses, walls, trees, hedges, and undulations of the ground—do on a small scale. The wind, therefore, near the ground has in most places a general though slight downward tendency, and in all open spaces between such obstacles, it must, for the same reason, have a much more marked deflection from the horizontal, returning upwards probably over the windward face of each obstacle.

It is obvious that this non-horizontal motion of the air must materially affect, if not entirely change, the conditions under which rain falls. It may possibly be a difficult matter to determine with mathematical precision the mode in which so irregular and inconstant a force would re-distribute the rain-drops. One effect it would probably have would be to deflect the paths of many of the lighter drops, as it rushed up over the face of an obstacle, and so carry them over, and bring them down again behind it, thus unduly augmenting the fall of rain in that position. Probably, also, most of us have noticed in driving rains a succession of what seemed to be almost vertical lines of dense rain, moving along within 20 feet or so of the ground. These occur, I fancy, when the downward tendency of a gust of wind assists the rain to descend vertically, or nearly so. (See diagram, fig. 2.) The con-

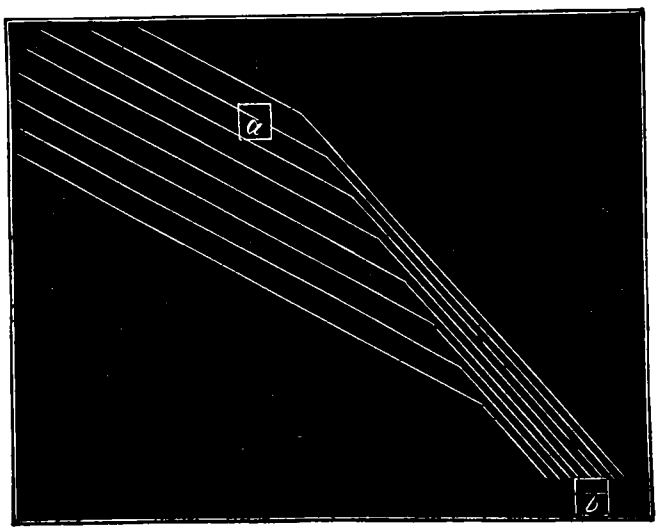
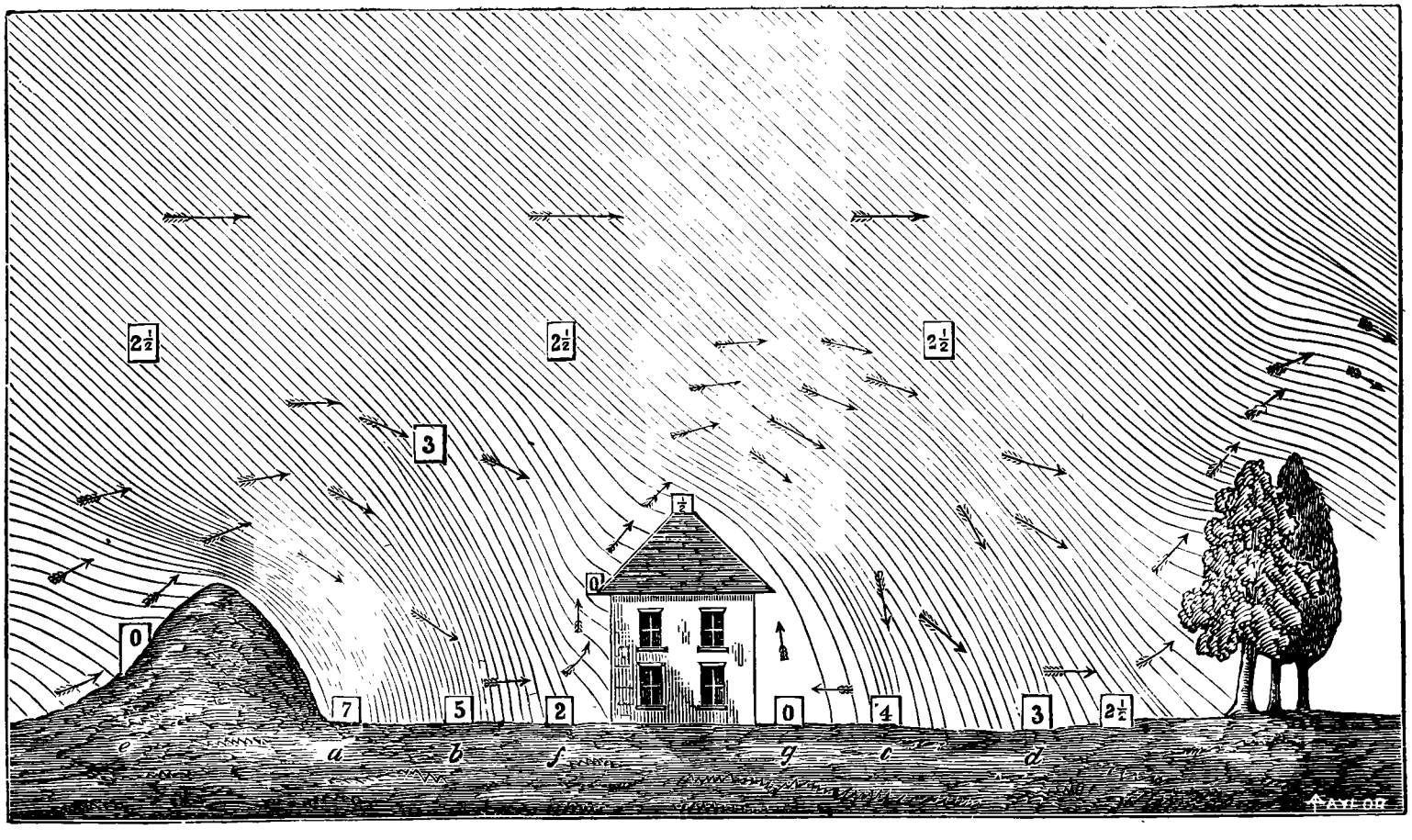


Fig. 2.



SKETCH SHOWING THE PROBABLE EFFECT OF NON-HORIZONTAL WIND-CURRENTS IN DISTRIBUTING THE FALL OF RAIN ON THE GROUND IRREGULARLY.

The arrows indicate the direction of the wind-currents, the lines the paths of the drops, and the figures the number of drops simultaneously received by equal gauges in different positions.

[*Face page* 21.

ditions then might be those contemplated as possible by Mr. Strachan, in a letter to the *Meteorological Magazine*, in which he showed that if the line along which the drops were deflected were not horizontal, the same amount of rain could not fall on a lower as on an upper gauge: for it would seem scarcely possible for a non-horizontal wind to deflect them along a horizontal line. It is true that the effect of such a gust would be momentary, and if succeeded by a corresponding up-current, would only fill the gauge at one moment with the rain of which it deprived it at the next. Still, if the average direction of the wind's motion were ever so little downward in any particular spot—as, for instance, in an open space between obstacles—this increase in the gauge on the ground would be permanent. The same effect would evidently be produced if the wind had a slight upward tendency at the level of the upper gauge, and its motion was horizontal at that of the lower, and would be intensified by an up-current at the one, and a down-current at the other.

The accompanying sketch will indicate the mode in which non-horizontal wind-currents might operate in unequally distributing the rainfall at any particular spot. The numbers within the squares are supposed to indicate the proportionate number of drops which gauges in those positions might be expected to catch. The differences are of course exaggerated, compared with what would generally occur in nature.

But whether I am right or not about the reason why a down-current causes increase and an up-current decrease of rainfall, there can be no doubt whatever about the fact. The experiments made with the "Position Series" of gauges are quite conclusive on this point. The analysis of all these experiments given in Table IV. B, brings out some very interesting results. The slope on which a gauge was placed faced N.N.W.: all winds, therefore, from any northerly quarter between W. and N.E. inclusive passed up the slope, and those from any southerly quarter between E. and S.W. inclusive blew down it. W.S.W. and E.N.E. were neutral winds, blowing along the slope; the former, however, descending towards the sea, the latter rising from it. It will at once be seen that all southerly winds increased, and northerly winds diminished, the fall on the slope, relatively either to the gauge in the lighthouse garden (a good and fair position), or to the gauge on the top of the hill; while E., E.N.E., and W.S.W. winds did not affect it much either way. And very much the same is the case with the gauge in the hollow, which was placed just where it widened into a nearly

level piece of marshy ground, which lay between it and the cliff edge: only that the winds which would be neutral for it would be W. and E., instead of W.S.W and E.N.E. Its readings represent the fluctuations possible in a gauge on level ground near hills (or other obstacles), and depending upon the wind's blowing down the hill (or over the obstacle), or from the other side. The "Cliff Edge" gauge was on a level projecting portion of the cliff, and about 16 feet from the edge. Nearly all winds, except S. and S.W., must have reached it with an upward tendency, consequent on their having impinged upon the perpendicular rock below, and its readings exhibit the effect of up-currents in diminishing the rainfall.

It is almost certain that a gauge on a pole, elevated as it frequently is above the level of surrounding objects, must experience downward currents in a much less degree than one on the ground, which, however open the situation, is necessarily below the level of not a few such objects. The deflection of the rain by the down-current takes place, therefore, below the level of such a gauge, and it therefore catches less than the gauge on the ground, the fall in which is augmented by the down-current. And this we call decrease with elevation, though perhaps it would be more accurate to call it—so far as it is due to this cause—increase with depression.

If this be true, there ought, on the other hand, to be a *tendency* towards increase with elevation, wherever there is a greater up-current along the surface of the ground, or over the face of an obstacle, than at an elevation above it. Such a case is intended to be represented in the sketch, where on the windward side of the mound and of the house, as well as on the actual top of it, there are fewer drops falling into the gauge than into those in mid-air. Positions such as those marked *e*, *f*, *g*, in the sketch, are always avoided as unsuitable for rain gauges, as no doubt they are, nor do I know that any experiments have been made for the purpose of detecting the existence of such irregularities as might produce increase with elevation; but it is not beside the mark to observe, that with northerly winds the gauge on the slope of Ling Hill facing N.N.W. caught invariably less than that on the top of the hill, which fulfilled many of the conditions of an elevated gauge. Again, if a gauge on the top of a building be compared with one in a good position on the ground, it ought to show more decrease with elevation than one at the same height upon a pole, because of the up-current over it. Accordingly, we find that while the per-centage of the ground fall caught by the gauges on the 20-foot poles at Strathfield Turgiss was

92·8, it was only 77·4 on the top of the barn, though not more than 3 feet higher, and as little as 74·1 on the top of the house,—a far greater ratio of decrease than would naturally be due to the height. And it is well known that at the same place the ground-fall varies considerably according to the position of the gauge. A gauge with a moderate though sufficient exposure in a garden generally catches more than one in an open field. This was the case at Hawsker, and, as I am informed, also at Strathfield Turgiss, and it is indeed a fact well known to the best authorities on rainfall, that if you wish a gauge to catch a maximum amount of rain, you must give it a little shelter. This certainly looks as if it were the consequence of the greater downward motion of the air in the more sheltered garden. It would not, however, necessarily follow that the most sheltered position would give the greatest ratio of decrease with elevation, because not only the angular deflection of the wind from the horizontal, but the force with which it blows must be taken into account, and these often would vary inversely. For instance, the average velocity of the wind all the year round was 21 miles an hour at Hawsker, in 1870, and perhaps it may be seven at Strathfield Turgiss. Now, although the wind may have been much more nearly horizontal near the 1 foot gauge at Hawsker than at Strathfield Turgiss, it must be borne in mind that it had three times the velocity, and this would account for a greater ratio of decrease at the former place.

It is my belief, then, that *if the whole of a shower were intercepted* 10 *or* 20 *feet above the ground, there would be just about as much rainfall at that height as actually falls to the ground within the whole area covered by the shower: but that the fall on the ground is most unequally distributed by upward and downward currents of air; the latter, for the reasons stated, prevailing in those places where we generally set our gauges, and causing, therefore, an excess in the fall at* 1 *foot over that at a height less affected by the down-current.*

It would be reasonable to expect that, if the view I have urged be correct, decrease with elevation would be greatest when the rain was most easily guided by the wind; and the instances of this would evidently coincide with those of maximum angular deflection from the vertical. This was long ago proved by the Rotherham experiments to be the case. It is evident also that without *difference* in the angle of falling rain with elevation, decrease could hardly occur, and it is highly probable that a down-current of air would cause a very marked change in the angle. At the same time it is true that decrease does not

necessarily occur because there is difference of angle. There must be another co-operating cause or causes, or, if you prefer to call it so, a disturbing influence; and I believe that the non-horizontality of the wind's motion is the principal and most powerful of such influences.

It must be borne in mind, however, when we speak of the angle of falling rain, that all drops by no means fall at the same angle. By carefully watching rain as it falls, especially in windy weather, it may readily be seen to what an extent the paths of the drops cross one another. The rain which chiefly fills vertical gauges is not the same with that which chiefly fills those which are horizontal. The light rain drives into the former, the heavy drops fall into the latter. The angle determined by the amounts caught by a pair of vertical and horizontal gauges can only be an average. Probably there are few occasions when there are not some drops so fine that if there is any wind worth speaking of, they can scarcely be said to be falling at all at a height above the ground, and it is quite impossible for them to enter a gauge at that elevation.* It is only slowly, then, and perhaps by the help of downward gusts, that these light drops reach a lower level: but as they approach the ground, the great diminution of wind-force permits them to fall into the gauge. We might expect, then, that (1) the greater the angle which the rain, taken as a whole, makes with the vertical, the greater the per-centage of it which is thus driven horizontally and excluded from the upper gauge: and (2) the greater the difference of mean angle at the two levels, the greater the number of those drops which, although excluded from the upper, find their way into the lower gauge. Hence decrease with elevation, depending upon these two conditions. In some positions this may be the chief cause of the observed decrease. For example, my gauges at 5 ft. and 10 ft. were both almost above all obstacles; there was a hedge just higher than the 5 ft. gauge 100 yards off to the N.W.; there was slightly higher ground 400 yards to the E.S.E., and a ridge of moor 150 to 300 feet higher from a mile to three miles off, to S.E., S., and S.S.W. They must, therefore, have been very little affected by any down-currents of air: whereas the 1 ft. gauge, which was below the level of the hedge of the field, and of the wire fence with which I surrounded the

* I cannot think it unreasonable to suppose that there is no such hard and fast line drawn in nature as in theory, and that, however possible it may be theoretically for a gauge to catch as much rain when it meets it at an angle of 89° with the vertical, as another which receives it at an angle of 60°, it is in reality incredible that it, or any other horizontal surface, should do so.

gauges at a safe distance, may have been considerably affected. While, therefore, the decrease of rainfall between 1 ft. and 5 ft. was due mainly to the down-current, that between 5 ft. and 10 ft., which has always been much less than that between 1 ft. and 5 ft. and has often been *nil*, was to a great extent, if not principally, due to this last cause: which, by the way, I would recommend to Dr. Burder as a substitute for his spray-theory, inasmuch as it has the advantage of not supposing anything the existence of which, as he says, is yet to be proved.

Another thing deserves consideration. Although "eddies" caused by a gauge may not affect the rainfall, and are, in fact, a bugbear, a gauge should, like any other obstacle, throw an up-current over its top. Suppose this sufficient to deflect, or even throw upwards some of the lighter drops: then, the stronger the wind, the stronger the up-current, and the greater the loss; while the same up-current would throw up more drops when they were driven at a great angle with the vertical than when the obliquity was less. Hence, of course, decrease with elevation. That the effect of this cause is not great may be inferred from the much greater tendency which a cylindrical gauge has to throw the wind sideways than upwards; and also from the fact that a flanged gauge, which must cause a much more powerful up-current than a cylindrical one, is found, nevertheless, always to register more instead of less than such a gauge, when tried at an elevation. Moreover, the Rotherham gauges are mere funnels, and it is scarcely possible for a thing of the shape of an inverted cone to cause any up-current whatever; and yet they show as much decrease with elevation as others. Still, it is quite possible that the effect may be in some cases perceptible, and it might be worth while to try a sort of elevated pit gauge, or gauge in a tub, with its mouth level with the brim of the tub; or to fasten, as a friend of mine suggests, a row of gauges together, and keep them to the wind endwise by a vane, and see whether the gauges behind catch more than those in front.

I have suggested these modes in which the wind may operate to cause a decrease with elevation in rain gauges placed as we generally place them. In each case the effect depends more or less upon the angle at which the rain meets each gauge, and it would, I think, from these considerations, be safe to infer a connection between it and decrease with elevation. But I can go further than this, and prove that this is actually the case.

Let me refer your readers to Tables V. and VI. in this paper. There

I have taken out on the one hand all instances in which the per-centage of the fall at 1 ft. caught at 10 ft. was less than 80 (except one small fall of 0·02 in. in which there was believed to be an error); and on the other hand, all instances in which it was above 95. I have worked out the angles in each instance to the nearest degree, and have added the direction and estimated force of the wind at the time.

Now I think any unprejudiced person, after examining these two tables, would say that, if the place and the year may be taken as fairly representative, all instances of unusually great decrease with elevation are instances of (1) great obliquity of fall at the level of the higher gauge, or (2) very considerable difference between the obliquity at that and at the lower level, or (3) both these combined. On the other hand, it would be fair to say, that all instances of very small decrease with elevation, are instances in which (1) the angle with the vertical at the higher level is comparatively small; or (2) in which there is but little difference between the angles of fall at the two levels. Suppose that for some reason or other, the presumed law is very nearly true when the angle with the vertical is small, but less so when it is great. It would follow that a difference—say of 5°—in the angle at the two heights, which would be comparatively unimportant when the angles with the vertical were respectively 20° and 25°, would have a marked effect when they were 80° and 85°. Now, is not this very much what we find to be the case? And further, is it not what we ought to expect, if the wind operates in the modes which I have indicated, to produce decrease with elevation? But, at all events, the undeniable fact which these tables appear to me to establish is this: *That decrease with elevation has a direct connection both with the absolute obliquity of the path of the falling rain at the higher level, and with the difference in that obliquity at the two levels.*

Table I.

Magnitude Series, &c.

Diameters of Gauges.	24-in.	12-in.	8-in.	6-in.	5-in.	4-in.	3-in.	2-in.	1-in.	8-in. flange.	5-in. high rim.	5-in. ordinary.	5-in. high rim in pit.
January	1·411	1·383	1·444	1·399	1·417	1·384	1·388	1·345	1·243	1·445	1·457	1·375	1·775
February	1·832	1·740	1·878	1·855	1·855	1·830	1·815	1·935	1·919	1·843	1·855	1·773	3·050
March	0·950	0·937	0·980	0·936	0·947	0·904	0·919	0·883	0·801	0·897	0·962	0·955	1·066
April	3·110	3·028	3·071	3·085	3·054	3·070	3·010	3·028	3·020	3·057	3·058	3·088	3·308
May	1·461	1·457	1·512	1·475	1·457	1·503	1·456	1·423	1·352	1·509	1·482	1·505	1·522
June	2·174	2·155	2·242	2·247	2·222	2·222	2·173	2·155	2·106	2·261	2·227	2·251	2·300
July	3·155	3·150	3·240	3·193	3·170	3·220	3·125	3·115	3·080	3·258	3·220	3·250	3·275
August	0·433	0·438	0·468	0·430	0·440	0·425	0·449	0·426	0·412	0·470	0·455	0·440	0·520
September	5·151	5·144	5·217	5·180	5·181	5·222	5·137	5·087	5·053	5·208	5·200	5·145	5·455
October (to 20th)	1·515	1·520	1·535	1·570	1·552	1·560	1·515	1·505	1·518	1·535	1·535	1·550	1·584
Totals	21·192	20·952	21·587	21·370	21·295	21·340	20·987	20·902	20·504	21·483	21·451	21·332	23·855

Table II.

Horizontal and Vertical Series.

	Horizontal.			Vertical.			Angle of falling rain with Vertical.			Calculated amount for a gauge with mouth perpendicular to path of rain.			Ratios of these last amounts.			Per-centage of fall at 1 ft. caught at 10 ft.	Wind—monthly means of			
																	At time of rain.			Mean velocity for 24 hours on days of rain.
	At 1 ft.	At 5 ft.	At 10 ft.	At 1 ft.	At 5 ft.	At 10 ft.	At 1 ft.	At 5 ft.	At 10 ft.	At 1 ft.	At 5 ft.	At 10 ft.	At 1 ft.	At 5 ft.	At10ft.		Estimated force 0—12.	Equivalent velocity	Actual velocity by anemometr	
	in.	in.	in.	in.	in.	in.	deg.	deg.	deg.	in.	in.	in.						miles.	miles.	miles.
Jan.	1·388	1·165	1·052	3·555	4·125	4·351	68°40′	74°14	76°24′	3·816	4·276	4·476	1000	1120	1173	75·8	5·2	26·7	...	25·7
Feb.	1·815	1·643	1·539	5·330	6·360	6·746	71 12	75 31	77 9	5·630	6·569	6·920	1000	1167	1229	84·8	6·0	30·8	...	25·7
March.	0·919	0·790	0·693	2·428	2·817	3·090	69 16	74 20	77 22	2·596	2·926	3·167	1000	1127	1220	75·4	5·6	28·6	...	26·8
April.	3·010	2·808	2·779	4·735	5·310	5·765	57 33	62 8	64 16	5·611	6·007	6·400	1000	1071	1141	92·3	3·9	19·3	...	18·0
May	1·456	1·339	1·327	0·818	0·858	1·059	29 20	32 39	38 36	1·670	1·594	1·697	1000	952	1016	91·1	3·4	17·0	...	16·9
June	2·173	2·036	1·988	1·792	2·014	2·309	39 31	44 41	49 17	2·816	2·864	3·046	1000	1017	1082	91·4	4·0	19·0	...	18·5
July	3·125	2·943	2·869	2·191	2·576	2·855	35 2	41 12	44 52	3·817	3·910	4·047	1000	1025	1060	91·8	2·7	11·9	13·5	...
Aug.	0·449	0·403	0·372	0·965	1·048	1·132	65 20	69 3	71 54	1·059	1·119	1·187	1000	1057	1122	83·5	5·3	28·0	26·3	...
Sept.	5·137	4·904	4·900	4·970	5·631	5·948	44 3	48 57	50 31	7·146	7·467	7·707	1000	1045	1078	95·4	2·8	12·9	13·3	...
Oct.(to 23rd)	1·566	1·454	1·430	1·429	1·579	1·714	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sums.	21·038	19·485	18·949	28·213	32·318	34·969	479 57	522 45	550 21	34·161	36·732	38·647	9000	9581	10121	781·5	38·9	194·2	..	...
Means.	...	...	...	...	...	...	53 18	58 5	61 9	3·795	4·081	4·294	1000	1065	1125	86·8	4·3	21·6	...	..

TABLE III.—*Evaporation Series.*

Date.	Rain in				Amount Evaporated from 12 in. cylinder.
	5 in. rim 3 in. high, read daily.	5 in. rim 3 in. high, read monthly.	5 in. rim 2 in. high (felt protected) monthly.	10 in. square. monthly.	inches.
January	1·780	...	1·710	1·630	0·500
February	2·230	...	2·115	1·978	1·000
March	1·110	...	1·140	0·925	1·420
April	3·305	...	3·332	3·110	1·230
May	1·480	1·502	1·465	1·225	2·460
June	2·264	2·330	2·300	1·970	2·640
July	3·043	3·030	3·015	2·490	2·810
August	0·485	0·500	0·460	0·280	3·980
September	5·663	5·665	5·655	4·905	2·570
Total	21·360	...	21·192	18·513	18·610
Total May to Sept. (5 months)	12·935	13·027	12·895	10·870	14·460

TABLE IVA.—*Position Series, at Ling Hill.*

	On hill-top, 315 ft.	On north slope, 285 ft.	In lighthouse garden, 198 ft.	In hollow or "valley." 205 ft.	On cliff edge, 195 ft.
(January 1st to 21st, results vitiated by snow.)					
January (22nd to 31st)	0·700	1·090	0·870	0·990	0·450
February	1·600	2·630	1·920	2·080	1·350
March	0·940	1·360	1·000	1·170	0·850
April	2·360	2·820	2·570	2·760	1·670
Total	5·600	7·900	6·360	7·000	4·320

Table IVb.

Analysis of Position Series, October, 1870, to April 1871, inclusive.

Amount received with the wind at.....	E.N.E.	E.	E.S.E.	S.E.	S.S.E.	S.	S.S.W.	S.W.	W.S.W.	W.	W.N.W	N.W.	N.N.W.	N.	N.N.E.	N.E.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Top of hill	0·07	2·34	2·16	0·69	1·71	1·87	1·67	0·27	0·44	0·16	1·08	0·42	0·52	...	2·11	...
Slope facing N.N.W...	0·09	2·39	2·84	1·44	2·24	2·71	2·18	0·35	0·42	0·12	0·74	0·31	0·32	...	1·60	...
Hollow	0·10	2·38	2·67	1·11	2·00	2·25	1·94	0·34	0·44	0·17	1·23	0·38	0·57	...	2·15	...
Lighthouse garden.....	0·10	2·52	2·42	0·99	1·81	1·89	1·80	0·30	0·41	0·17	1·35	0·44	0·77	...	2·30	...
Cliff Edge	0·05	0·75	1·45	0·66	1·41	1·67	1·64	0·29	0·40	0·11	0·70	0·26	0·35	...	1·21	...

Per-centages of the fall in the Lighthouse Garden.

	E.N E.	E.	E.S.E.	S.E.	S.S.E.	S.	S.S.W.	S.W.	W.S.W.	W.	W.N.W	N.W.	N.N.W.	N.	N.N.E.	N.E.
Top of hill	70	93	89	70	94	99	93	90	107	94	80	95	67	...	92	...
Slope facing N.N.W...	90	95	117	145	124	143	121	117	102	70	55	70	42	...	70	...
Hollow	100	95	110	112	110	119	108	113	107	100	91	86	74	...	94	...
Cliff Edge	50	30	60	67	78	88	91	97	98	64	52	59	45	...	53	...

Table V.

Instances of greatest decrease with elevation, 1871.

Date.	Horizontal Gauges.		Percentage of fall at 1 ft. caught at 10 ft.	Vertical Gauges.		Angle with vertical.		Wind at time.		REMARKS.
	At 1 ft.	At 10 ft.		At 1 ft.	At 10 ft.	At 1 ft.	At 10 ft.	Direction.	Estimated force, 0—12.	
	in.	in.		in.	in.	deg.	deg.			
Jan. 11	0·450	0·328	73	1·390	1·600	72	78	N.W.	5	Snow.
,, 16	0·400	0·313	78	1·120	1·370	70	77	S.S.E.	9	Rain with heavy gale.
,, 29	0·068	0·040	59	0·210	0·220	72	79	E.N.E.	3	Snow showers.
Feb. 13	0·390	0·295	75	2·460	3·240	81	85	S.E.	9	Snow storm, great drifts.
,, 15	0·020	0·002	10	0·045	0·060	66	88	S.S.W.	4	Drizzling rain; gauge at 5 ft. 0·005
March 5	0·022	0·003	14	0·010	0·020	24½	81	W.S.W.	5	Light rain.
,, 9	0·460	0·350	76	1·400	1·780	72	79	S.	8	Sleet and rain with gale.
,, 11	0·040	0·022	55	0·090	0·115	66	79	S.S.W.	7	Rain in night till 9 a.m.
,, 16	0·052	0·036	59	0·220	0·312	77	83	E.	4	Snow in night till 6 a.m.
,, 17	0·004	0·000	0	0·002	0·006	26	90	W.S.W.	3	Snow, 11 to 12.30.
,, 28	0·004	0·000	0	0·065	0·091	87	90	N.N.E.	5	Snow showers.
May 9	0·029	0·010	34	0·070	0·080	67	83	N.	7	Rain in early morning, with N. gale.
June 3	0·045	0·017	38	0·092	0·075	64	77	N.	7	Showers on 2nd and 3rd, with gale.
,, 4	0·020	0·008	40	0·035	0·038	60	78	N.	4	Shower.
,, 8	0.025	0·010	40	0·170	0·290	82	88	N.	7	Light rain towards the end of a heavy gale
,, 20	0·030	0·022	73	0·068	0·118	66	80	N.	4	Rain 9 to 10 p.m.
August 24	0·090	0·055	61	0·352	0·375	76	82	W.S.W.	7	Rain with gale.
Sept. 20	0·065	0·025	38	0·072	0·095	48	75	N.E.	2	A few light showers.
,, 29	0·265	0·200	75	0·555	0·620	64	72	E.N.E.	4	Rain from 8 p.m.
,, 30	0·140	0·108	77	0·220	0·268	57½	68	S.W.	3	Rain in early morning of October 1st.
Sums	2·619	1·844	975	8·646	10·773	1298	1612		107	
Means ...	0·131	0·092	48·6 70·3	0·432	0·539	64°54′	80°36′	. .	5·3	

Table VI.

Instances of least decrease with elevation.

Date.	Horizontal Gauges.		Per-centage of fall at 1 ft. caught at 10 ft.	Vertical Gauges.		Angle with vertical.		Wind at time.		REMARKS.
	At 1 ft.	At 10 ft.		At 1 ft.	At 10 ft.	At 1 ft.	At 10 ft.	Direction.	Force, 0—12.	
	in.	in.		in.	in.					
April 18	1·318	1·274	97	2·840	3·390	65	69	E.S.E.	6	R. aft. and even. of 17th ; RR. at night on 18th from 4 p.m.
,, 19	0·454	0·435	96	0·508	0·578	48	53	S.S.W.	5	T storm 6 to 7 p.m. (·33 in. 25 min) ; R again at night
May 25	0·785	0·765	97	0·102	0·130	7	10	Z.	0	R 3 p.m. to 11 p.m.
June 14	0·667	0·658	99	0·553	0·658	40	45	S.E.	4	RR 10 a.m. to noon, and again at night.
,, 16	0·382	0·362	95	0·202	0·260	27	35½	N.W.	1	RR at night
,, 28	0·220	0·215	98	0·105	0·108	26	27	N.W.	3	R 7 a.m. to 9 a.m.
July 2, 4	1·350	1·290	95½	1·100	1·480	39	48	E. & S.W.	4	R in evening and at night on 2nd and 4th.
,, 31	0·540	0·520	96	0·242	0·320	24	32	E.S.E.	2	T storm 2 to 6 p.m.
Sept. 2	0·420	0·420	100	0·110	0·170	15	22	N.W.	1	R from about midnight to 8.30 a.m.
,, 6	1·850*	1·880	102	0·880	1·020	25	28	N.W.	3	RR c. 6 p.m. ; very heavy 10 p.m. to 12, with incessant T and L from 11 to 12.
,, 9	0·365	0·355	97	0·400	0·540	48	57	E.	4	Clouds down below this level, and almost to sea level.
,, 21	0·040	0·040	100	0·018	0·010	24	14	Z.	0	R 6 to 8 p.m., 5 ft. vertical gauge 0·015 in.
,, 24	0·940	0·905	96	0·668	0·780	35	41	N.E.	3	RR 10 a.m. to 8 p.m. on 24th
,, 27	0·905	0·875	96	1·945	2·315	65	69	E & N.	6	R all day from 8 a.m. 27th to 10 a.m. 28th.
Sums.....	10·236	9·994	1364½	9·673	11·759	488	550½	...	42	
Means ...	0·731	0·714	97·5 97·6	0·691	0·840	34°51′	39°19′	...	3·0	

* Other gauges at 1 ft. caught from 1·87 to 1·93.

ON THE CAUSE OF THE DECREASE OF RAIN WITH ELEVATION.

By George F. Burder, M.D., F.M.S.

In offering a few suggestions towards the settlement of this much-vexed question, it will be necessary, first, to refer briefly to some views lately advanced, which are tantamount to denying that there is any real difference in the quantity of rain falling at different heights.

Mr. Stow's theory, put forward in *British Rainfall*, 1870, and defended by himself and others in recent numbers of the *Meteorological Magazine*, is that "elevated gauges catch less than those near the ground, simply because the rain strikes them at a smaller angle with the horizon." There is not less *rain*, he says, at a height above the ground, although there is less *rainfall* upon a horizontal surface. Having already fully stated my views with regard to this theory in the pages of the magazine, I will only now say that I still believe it to be entirely erroneous.

Mr. Crallan, in the magazine for September, 1871, contends that the rain-drops in falling approach one another, and that this is the reason why the lower of two gauges receives more than the upper. The obvious reply to this explanation is, that any approximation of the drops in one place, so far as it is independent of fresh formation of rain, implies an equivalent separation of the drops in another place, and that, therefore, whatever increase in the quantity of rain at the lower levels may be so occasioned in a particular place at a particular time, must be exactly counterbalanced by a decrease at other places, or at the same place in the long run.

Mr. Warren, in the magazine for December, 1871, accounts for the observed deficiency of rain at an elevation by causes which may be grouped under the head of mechanical imperfections in the method of measurement. He assigns three such causes—(1) the rebounding of the wind from the interior of the funnel; (2) the eddying of the wind around the gauge; and (3) the out-splash of rain—each of these

causes of loss being, as he fairly argues, greater at an elevation than near the ground. Now, with regard to the first and second of these, I submit that it has yet to be proved that either of them would produce the effect attributed to it. Indeed, with regard to eddies, my impression is, that the effect would be exactly the reverse, tending to concentrate or condense the drops in the situation of the eddy, as we see to happen in the case of snow and dust. The third cause suggested—the out-splash of rain—if influential at all, must surely be so in a degree quite inadequate to explain the large difference observed.

I conclude, then, that the old notion of the rain actually increasing in quantity in the lowest strata of the atmosphere is, after all, the correct one. Rain, as I take it, is really formed near the earth, as well as amongst the clouds. Mr. Franklen G. Evans has correctly described this formation in the November magazine, as a "cumulative process," but neither he nor Mr. Malet, who endorses his view, has given, to my mind, any satisfactory explanation of the mode in which the latter stages of this "cumulation" are brought about. Mr. Evans writes of the "action begun above"—that is, in the clouds—being "continued down to the ground," and Mr. Malet concludes that "the weight and size of the rain-drops increase as they reach the point of attraction," that is, the earth; but when we have admitted this, we have only enunciated—not solved—the problem.

The difficulty, simply stated, is this. Of the whole quantity of rain which falls on the ground—apparently from the clouds—a very considerable proportion is generated below the level of the tops of our houses—generated, as it were, out of nothing. Mr. Malet's experience amongst the mountains of Western India, related in the magazine for December, however interesting in itself, helps us not at all in this matter, for there he was in the clouds, just the place where rain should be formed. Our difficulty is, that we are not in the clouds, and yet rain is formed in the air immediately about us. I look in vain for a solution of this puzzle in Mr. Malet's letter. Mr. Evans suggests a solution, namely, the electricity of the earth. But electricity is ever the last resource of the baffled meteorologist, and its introduction here, without some more definite explanation of the manner in which it is supposed to operate, seems to me rather to thicken the obscurity than to clear it up.

Speaking generally, there would seem to be only two possible ways in which this supplementary formation of rain can take place. According to the hypothesis hitherto generally accepted, it is due to

the condensation of vapour from the comparatively warm air of the lower levels by the cold drops from above, each drop becoming thus augmented in volume. But it happens that the increase possible from this source admits of calculation, and Sir John Herschel has shown conclusively (*Meteorology*, p. 104), that the utmost effect which can be assigned to it is insignificant in comparison with the difference actually observed. The other—and, as I am inclined to think, the only other—possible explanation is, that during rain particles of water exist suspended in the lower strata of the air, and that the drops of rain, as they fall, lick up and incorporate these particles.

Postponing for the moment a consideration of the mode in which this diffusion of watery particles is to be accounted for, I would first insist that there is nothing essentially improbable in the supposition of their presence. Mr. Stow's objection, in the October magazine, that he cannot "believe in the existence of bodies not acted upon by gravitation," must have originated in a misapprehension. It is certain that both liquid and solid matter, in a fine state of division, may remain suspended in the air for an indefinite time. But it may be said that these particles, if present in any quantity, would give rise to visible fog. An important consideration bearing upon this question will be adduced further on. It may be sufficient at present to remark, that when rain is falling the air is necessarily more or less opaque, and no one can say certainly that a portion of the opacity is not due to suspended particles of water. It may further be objected, that the diffusion of minute particles of water through the air is inconsistent with any hygrometric condition short of complete saturation, and that the air is not invariably saturated during rain. It might be instructive to analyse a series of elevation differences with reference to this particular point. Provisionally, it may be said that the air often is saturated during rain—much oftener, probably, near the ground than at four feet above it—and that no evidence exists to disprove the supposition that it is only at times when, and within strata in which such saturation obtains, that the phenomenon of elevation-difference occurs.

There is nothing, then, incredible in the idea that during rain the lower air is charged with minute watery particles, too small and light to subside quickly by their own weight, but ready to be caught up and absorbed by the falling drops.

It is not necessary to define the form in which these watery particles exist. As the form of the particles composing clouds and fog is still *sub judice*, so also must be the form of these.

More to my purpose is it to show the mode in which I believe their presence may be explained. Writing in the September number of the *Meteorological Magazine*, I used the term "spray," as suggesting the mode of production which was then uppermost in my mind. I conceived that possibly the dashing of the rain-drops upon terrestrial objects might create a cloud of fine spray, which, as it floated through the air, might be caught up and incorporated by succeeding drops. And anticipating the objection that the rain-gauge, as a terrestrial object, would lose by dispersion of particles going to form the spray, as much as it would gain by their re-collection, I admitted that the theory was only tenable on the assumption that a rain-gauge would suffer less than the average loss by such dispersion. This, I see now, was a needless admission; for it is possible that the lower of two gauges, though it gained nothing on the balance as compared with the true fall, might yet gain as compared with the higher gauge, which, sustaining an equal or even greater loss, would, by reason of its elevation above the general cloud of spray, be debarred from any compensating gain.

If this view were correct, it ought to follow that the difference due to elevation would be largest in heavy rains. Mr. Stow, in the October magazine, says that "elevation-differences are always small in heavy rain"—a statement which, if literally substantiated, should settle the question. But without knowing precisely in what way this result has been obtained, I suspect that possibly the effects of persistence may have been mixed up with those of intrinsic heaviness. In the December magazine, Mr. Stow remarks that "decrease with elevation is great in showery and light rains, and least, sometimes *nil*, in heavy and continuous down-pours. This may be quite true, and yet it may be that the heaviness tends to increase the difference, the diminution of difference being due to continuity alone.

With a view to throw, if possible, some further light on this matter, I have investigated the effect of thunderstorms on elevation-difference. The rain of thunderstorms is certainly much heavier than the average of rain, while it is not, perhaps, more continuous than the average. Tabulating the rainfall of ten years (1853-1862) at this station, I find that a gauge at an elevation of 50 feet, showed a deficiency for the whole period, as compared with a gauge on the ground, of 12 per cent. Fifty thunderstorms occurred during these ten years, and of the rain that fell on the ground in those fifty storms, the upper gauge wanted 11 per cent. The elevation-differences are therefore not greater in the

heavy rain of thunderstorms than in the average of all kinds of rain—a result which seems incompatible with the supposition that these differences are occasioned in any large degree by the separation and re-absorption of spray.

In looking over the various tables of rain collected at different elevations which have been published in *British Rainfall*, one constant feature has struck me as very significant with reference to the cause of the differences. I allude to the marked discrepancy between the rates of decrease at different heights.

Out of a mass of available material, I select, for illustration, two series of observations—namely, the observations by Mr. Chrimes, published in *British Rainfall*, 1870, pp. 26, 27, and the Calne observations, published in *British Rainfall*, 1867, p. 29.

Analysing Mr. Chrimes' observations, I find that the rate of decrease per cent. in the amount collected at each elevation, calculated on the amount collected at the elevation next below it—the differences of elevation being equal in every case except the first—is as represented in the following table :—

TABLE I.

Analysis of Mr. Chrimes' Observations.

Elevation.	Decrease per cent.
Between 1 ft. and 5 ft.	6·0
,, 5 ,, ,, 10 ,, ...	4·4
,, 10 ,, ,, 15 ,, ...	1·4
,, 15 ,, ,, 20 ,, ...	1·1
,, 20 ,, ,, 25 ,, ...	0·9

Applying a similar method to the Calne observations, I obtain the following results :—

TABLE II.

Analysis of Calne Observations.

Elevation.	Decrease per cent.
Between "Isolated level" and 1 ft.	4·8
,, "Isolated level" ,, 6 in.	3·3
,, 6 in. ,, 1 ft.	1·5

It is impossible, I think, to examine the foregoing tables without feeling convinced that they contain the germ of the solution of this

difficult problem. It will be seen that the rate of decrease in the first six inches from the ground was more than double the rate in the second six inches, that the total rate in the first foot was greater than the rate in the second five feet, and that the rate between 20 and 25 feet was little more than a fourth part of the rate in the first six inches.

These are very remarkable results, and I venture to draw from them two conclusions.

1. The formation of rain, although "a cumulative process," is by no means a uniformly continuous process—probably is not, under ordinary circumstances, continuous at all. The bulk of the rain comes from the clouds, little or none is drawn from the air next below the clouds, but a large addition is derived from the strata in the immediate neighbourhood of the earth, the rate of addition being continually and rapidly accelerated until the rain reaches the ground.

2. The cause of this rain-formation near the earth is to be sought in the earth itself, and this not through any electrical, or magnetic, or other occult influence, but simply from the effect of temperature.

I imagine the earth to be enveloped during rain with a thin cloud or mist, due to the condensation of vapour from the moist air by the relatively cold ground, by vegetation, and by terrestrial objects generally. The watery particles constituting this cloud are, as I suppose, being constantly absorbed by the falling drops of rain, and as constantly replaced by fresh condensation, this incessant removal and reproduction serving to explain how it is that so considerable an effect is produced from a cause so little obvious to the senses.

I believe this theory to be in harmony with the known facts of meteorology. We see that fog forms, even in dry weather, when circumstances are favourable to the cooling of the surface by radiation. The air during rain cannot be otherwise than heavily charged with vapour, and a very slight degree of relative coldness of the earth would suffice to produce condensation; the result being, if not actual cloud, at least *potential cloud*—a term by which we may conveniently express the idea, that if the process of absorption were intermitted, while the process of condensation still went on, visible cloud would be formed.

To a certain extent it must be allowed that the theory rests at present on an assumption. I am not prepared to prove that the earth is generally colder than the air during rain. Observations are to be desired on this point, as also are comparisons of elevation-differences

in falls of rain specially selected with a view to test the theory. For example, in the warm rain of a thaw, after continued frost, I should expect the difference to be large, and in a cold rain from the north-east, with a rapid fall of temperature, I should expect the difference to be small. Should these inferences prove correct, the test would be the more crucial, inasmuch as the result would be contrary to that produced by the direct condensation of vapour upon the drops. In the meantime, the theory seems to me to furnish a satisfactory account of Mr. Stow's observation, that the differences are less in continued rain than in showers. The cooling of the earth is due in great measure to radiation. Radiation is impeded by clouds, and also by vapour in the air. When rain falls in showers, the intervals of drier air and clearer sky permit freer radiation. On the other hand, when rain is continuous, radiation is reduced to a minimum.

In commending the foregoing views to the consideration and criticism of meteorologists, it may not be superfluous to remark that, for a just appreciation of them it is essential that the distinction be clearly recognised—first, between vapour and cloud; and, secondly, between the processes of cloud-formation and rain-formation.

It is unfortunate that the term "vapour" is used in a twofold sense. Even in scientific works, as in one lying before me now, cloud is described as "visible vapour," and nothing is added with a view to guard the reader against the confusion likely to arise from that form of expression. Cloud, it must be remembered, is not vapour at all in the scientific sense of the term, but is composed of liquid water in a finely-divided state.

The nature of the processes by which clouds are formed may be said to be pretty fully known. One influential principle concerned is that according to which two volumes of air of different temperatures, when mixed, are not capable of holding the same quantity of watery vapour which they were capable of holding when separate. Possibly in every case in which cloud is formed, this principle is more or less involved. Be that as it may, there are certain cases in which the presence of a cold object is the condition upon which the formation of cloud most obviously depends. The fogs that accompany icebergs, and many, at least, of the ordinary fogs that occur on land, may be thus explained.

The mode of formation of rain is less clearly understood. When two volumes of air are mixed under circumstances which compel them to part with a portion of their vapour, or when from any cause a mass of air is cooled below its dew-point, the immediate result is cloud—

not rain—and hence it becomes interesting to inquire what further conditions are necessary, in order that the minute particles composing the cloud shall coalesce and descend as rain. In this inquiry, however, we are checked by our ignorance of the actual constitution of cloud. Are the component particles globules or hollow spheres? Are they uniform, or variable in size? Are they promiscuously distributed, or is it possible that they are maintained at regular distances apart by a balance of attractive and repulsive forces? Until these questions are answered, we can scarcely hope to know certainly how the formation of a rain-drop begins, although we may more easily explain its growth.

Postscript.—Since the preceding remarks were written, a theoretical difficulty has occurred to me, the discussion of which has not only confirmed me in my previous views, but has brought to light what I conceive to be the true explanation of the increase of elevation-differences in windy weather.

The difficulty is this. The formation of rain near the earth is due, we say, to the absorption of cloud-particles. The production of these cloud-particles is due to the condensation of vapour from the saturated air by the relatively cold earth. But if the air during rain be, irrespectively of the earth, so near saturation that the contact of the slightly colder earth suffices to complete the process, this approach to saturation must be due to the giving off of vapour from the falling drops. Hence it may be argued, that if the rain damps the air, and the cold earth condenses the vapour, and the rain again takes up the condensed product, the rain, after all, only takes up that which it had previously lost, and there is no increase on the whole.

I believe this argument would be sound if the air were absolutely calm. But the air being in motion, fresh bodies of damp air are being continually brought up, and these new supplies of air are not simply damp from the influence of the falling rain (in which case the argument might still hold), but they are intrinsically damp, their humidity standing, perhaps, towards the rain rather in the relation of cause than of effect. The real source, therefore, whence the rain is derived which is formed near the earth, is the body of moist air which accompanies rain, and the more rapidly this air is renewed by successive portions coming to take the place of those which have been deprived of a part of their vapour in the manner already described, the more abundant will be the formation of cloud-particles, and therefore of rain.

These considerations appear to me to furnish a sufficient explanation of the influence of wind in increasing the elevation-difference. Perhaps they may also help us to an understanding of the remarkable discrepancies between the results obtained by different observers. Thus, in the tables to which I have before referred, the decrease betwen one foot and 20 feet is, according to Col. Ward, 6 per cent.; according to Mr. Chrimes, 12 per cent. Considering the extreme care with which both sets of observations were evidently taken, we are driven to the conclusion that the difference is local; and if so, it may be due partly to the greater or less windiness of the two situations; partly, also, to the greater or less habitual humidity of the air, and to the drier or wetter character of the region over which the rainy winds chiefly blow.

THE DURATION, HOURLY FREQUENCY, AND RATE OF RAINFALL.

By Frederick Ernest Sawyer, F.M.S.

These observations were, during 1871, recorded on the plan described in *British Rainfall*, 1870 :—

Hourly Frequency.—The observations under this heading are shown in Tables I and II. At Brighton the greatest frequency in any hour was eight times, from 2 to 3, and 3 to 4 p.m. in January. The least frequency was no rain in the summer months and November. The totals of the year show the greatest frequency to have been 44 times, from 2 to 3 p.m., and the least frequency from 9 to 10 a.m. The period of maximum frequency is thus again from 2 to 3 p.m., and it is somewhat singular that this year, three maximum and three minimum periods of frequency occurred, as hitherto we have only heard of two daily. The maximum periods were 3 to 4 a.m., and 2 to 3, and 9 to 10 p.m., and the minimum periods 9 to 10 a.m., 6 to 8 p.m., and 11 p.m. to midnight; probably the third maximum period was only an extension of the early afternoon maximum. At Bogside, Aberdeenshire, the greatest monthly frequency was nine times, from 3 to 4 p.m. in July. No rain fell during several hours in various months. The greatest frequency was from 3 to 4 p.m. (44 times), and the least frequency from midnight to 1 a.m. (11 times). The maximum period being at the same hour as last year, but still one hour later than at Brighton. Professor Loomis says, "that the observations of a long series of years at Philadelphia show the minimum of rain at noon and midnight, and the maximum in the morning and evening, being the same as at Greenwich," and, doubtless, future observations will prove this law to be of general application.

Duration.—The monthly total duration of rain at Brighton ranged from 80 hours in February to 3 hours 17 min. in May, and at Bogside from 106¼ in April, to 12¾ in March. The total duration of rain in the

year at Brighton was 538 hours 45 min., or 22 days $10\frac{3}{4}$ hours, being about 55 hours less than last year. In order to show that there is no great difficulty in recording the duration of rain, it may be mentioned that in Canada, where meteorological observations are recorded for the State by the masters of grammar schools, the duration has been for some years carefully registered. From the *Stratford Beacon* (Canada), I find that in 1867 the duration of rain at Stratford was 468 hours, the depth in inches being 25·23, and the duration of snow 469 hours, the depth being only 11·9 inches, showing a total duration of 937 hours with a total depth of rain and melted snow of 37·13 inches, which would give an hourly rate of nearly ·04 of an inch, being slightly less than at Brighton. During the year special attention was directed to the frequent measurement of rain whilst falling, and it was found that the rain when measured every minute or two, gave much greater hourly rates than those I showed last year in the table of maximum rates. The rapidity of fall was very marked in a short thunder-shower on the 8th May last, which is shown by the following table :—

p.m.	Duration. minutes.	Amount. in.	Hourly rate. in.
5.20 to 5.23	3	·017	·340
.23 ,, .25	2	·028	·840
.25 ,, .28	3	·003	·060
.28 ,, .30	2	·018	·540
.30 ,, .35	5	·009	·108
.35 ,, .40	5	·005	·060
.40 ,, .42	2	·001	·030
Total...5.20 to 5.42	22	·081	·222

Rate of Rainfall.—This is calculated by dividing the sum of rainfall by the duration.

In Table III. the monthly hourly rates of rainfall for 1871 at Brighton and Bogside are shown, and also the rates in previous years for comparison.

Table IV. gives the average rates for the seasons. The observations of last year showed that rain fell twice as fast in the summer as in the winter, and twice as fast in the autumn as in the spring; this year, owing to the autumn drought, only the first part of this law was exemplified, but still was very distinctly marked both at Brighton and Bogside. The increased rate of rainfall in the summer and autumn months is probably caused by the greater daily range of temperature, which occasions great condensations of vapour and rapid rains; in the winter, with a small daily range, the condensation of the vapour is

not so great, and then the rain falls slowly. As many persons like to have weather proverbs verified or disproved by observations, I have examined all my records to see what dependence could be placed on the proverb, "Rain before seven, clear before eleven," a proverb based on the hourly frequency of rain. In the last two years and a half I find there was rain before seven o'clock a.m. on 159 days. On 68 of these days there was *no* rain after 11 a.m., and on 106 days the weather cleared up before 11 a.m., and there was no rain until 2 p.m., or after that hour. Thus we find that on two-thirds, or 66 per cent. of the number of days when rain fell before 7, it cleared off before 11, and was fine until 2 p.m., and on nearly half of these days there was no rain after 11; the proverb, therefore, is well borne out by observation.

In conclusion, I have again to thank W. Bruce, Esq., for his continued kind assistance, but still regret that out of 1,500 observers, *only one* gives me any assistance in these investigations.

TABLE III.—*The hourly rate of Rainfall (monthly.)*

	Brighton.			Bogside.	
	1869.	1870.	1871.	1870.	1871.
	in.	in.	in.	in.	in.
January	...	·024	·038	...	·030
February	...	·022	·021	...	·041
March	...	·034	·032	...	·065
April	..	·014	·072	·060	·038
May	...	·048	·049	·067	·050
June	...	·044	·073	·076	·091
July	·056	·057	·044	·147	·104
August	·057	·074	·083	·061	·067
September	·091	·079	·055	·084	·055
October	·067	·052	·062	·058	·058
November	·031	·050	·029	·077	·043
December	·040	·033	·033	·045	·044
Mean	...	·044	·049	...	·057

TABLE IV.—*The hourly rate of Rainfall (seasons.)*

	Brighton.			Bogside.	
	1869.	1870.	1871.	1870.	1871.
	in.	in.	in.	in.	in.
Winter (Dec. to Feb.)	...	·029	·033	...	·039
Spring (March to May)	...	·032	·051	...	·051
Summer (June to Aug.)	..	·058	·067	·095	·087
Autumn (Sept. to Nov.)	·063	·060	·049	·073	·052

TABLE V.—*The hourly rate of Rainfall (maximum rates.)*

	BRIGHTON, 1871.				BOGSIDE, 1871.		
	in.		Date.		in.		Date.
January	·114	...	18th	.....	·108	...	15th
February	·080	...	10th	.....	·200	...	4th
March	·240	...	9th	.....	·080	...	31st
April	·171	...	26th	.....	·200	...	30th
May	·840*	...	8th	.....	·120	...	19th
June	1·610*	...	14th	.....	1·575	...	19th
July	·570	...	24th	.....	·375	...	11th
August	·720	...	18th	.....	·094	...	22nd
September	1·200	...	24th	.....	·085	...	23rd
October	·520	...	7th	.....	·200	...	1st
November	·060	...	14th	.....	·110	...	11th
December	·240	...	19th	.....	·190	...	3rd

* Thunder showers.

F. E. SAWYER, F.M.S.

Brighton, January, 1872.

Table I.

Shewing the number of times rain fell during every hour in every month. Observations made at 55, *Buckingham Place, Brighton, Sussex, by* F. E. Sawyer.

Lat., 50° 49′ 56″ N. Lon. 0° 9′ 13″ W. 200 feet above sea.

Months. 1871.	BETWEEN WHAT HOURS. A.M. Mid. to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to noon	P.M. noon to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to mid.	Total duration of Rain. hrs.	min.	Rain. Sum. inches.
Jan. ...	3	2	2	3	2	3	4	4	2	5	5	4	6	4	8	8	7	5	4	2	3	3	3	2	75	45	2·87
Feb. ...	3	3	3	3	4	4	5	5	5	5	5	4	6	4	5	5	4	6	4	4	5	3	2	1	80	0	1·70
March	2	2	2	2	2	1	1	2	2	1	...	1	1	1	3	3	2	1	1	1	3	4	2	...	25	15	0·81
April..	3	3	3	4	3	3	3	3	4	5	5	4	4	4	4	5	4	2	5	3	3	4	3	2	56	50	4·09
May....	...	...	...	...	...	...	...	...	..	...	1	1	...	...	2	2	1	2	...	1	...	...	..	...	3	17	0·16
June .	3	3	4	3	4	5	4	1	2	1	...	...	2	3	4	4	2	2	4	2	4	6	4	4	51	15	3·75
July ...	5	5	3	5	2	3	5	3	4	2	2	3	3	4	5	4	4	4	2	3	5	6	5	4	70	35	3·34
August	1	1	2	2	1	...	...	...	..	...	...	...	...	2	2	1	2	...	...	1	2	3	2	2	17	10	1·42
Sept....	2	3	4	5	5	3	3	5	2	...	1	1	4	3	3	3	5	5	4	5	3	2	3	2	58	28	3·19
Oct. ..	...	2	2	3	3	4	4	3	2	2	3	1	1	...	4	3	3	1	2	2	2	1	3	1	23	5	1·44
Nov....	3	...	...	...	1	1	...	1	1	...	...	1	1	1	1	1	1	...	...	2	2	3	3	4	23	0	0·67
Dec. ...	2	2	2	2	2	3	2	1	2	1	2	4	5	3	3	4	4	2	2	2	3	3	3	2	54	5	1·81
Total..	27	26	27	32	29	30	31	28	26	22	24	24	33	29	44	43	39	30	28	28	35	38	33	24	538	45	25·25
Total 1870	22	22	22	32	34	31	29	25	24	32	34	37	29	32	38	37	33	38	32	26	31	35	30	21	593	40	24·18

Table II.

Shewing the number of times rain fell during every hour in every month. Observations made at Bogside, Leochel Cushnie, Aberdeenshire, Scotland, by W. Bruce, Esq.

Lat., 57° 10′ 50″ N. Lon., 2° 40′ 0″ W. 882 feet above the sea level.

Months. 1871.	BETWEEN WHAT HOURS. A.M. Mid. to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to noon.	P.M. noon to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 to 11	11 to mid.	Total duration of Rain. hrs.	min.	Rain. Sum. in.
January..	...	...	1	2	2	1	3	2	2	3	4	3	1	1	1	2	1	1	1	3	2	...	...	...	35	15	1·01
February	2	2	2	2	3	5	5	4	6	3	6	3	5	6	4	2	2	4	2	2	2	2	2	2	73	0	3·03
March ...	...	...	...	...	1	1	...	...	1	1	...	1	1	...	1	2	3	1	1	1	2	1	1	...	12	45	0·70
April....	3	4	5	5	7	7	10	6	4	4	2	6	6	9	5	8	7	9	7	5	4	3	3	3	106	15	4·09
May.....	...	...	...	1	2	1	1	1	2	2	1	...	2	2	2	2	2	1	1	1	...	...	..	...	18	15	0·91
June.....	...	...	1	1	2	4	3	1	1	2	2	4	3	3	4	2	3	2	1	1	3	2	...	...	28	45	2·50
July	1	1	1	1	...	...	1	...	...	2	2	6	2	6	5	9	8	4	6	4	3	2	3	2	42	15	4·42
Aug	1	...	1	1	1	2	2	2	3	4	4	3	3	2	2	4	2	3	2	1	2	1	1	1	39	15	2·62
Sept.....	1	1	3	2	6	3	3	5	2	2	3	4	3	3	3	6	5	2	6	2	3	2	2	1	60	25	3·30
Oct.	1	1	1	1	5	3	4	5	4	4	4	3	5	5	3	4	3	5	3	4	4	2	2	1	69	30	4·07
Nov.....	1	2	4	1	2	4	4	4	6	4	4	4	2	2	4	1	1	3	1	7	2	3	1	1	40	25	1·75
Dec.....	1	2	1	...	1	1	1	2	4	1	2	...	2	1	...	2	1	1	2	3	1	2	3	1	21	15	0·95
Total.....	11	13	20	17	32	32	37	32	35	32	34	37	35	40	34	44	38	36	33	34	28	20	18	12	547	20	29·35
Total Aprl. to Dec.1870	7	9	18	18	21	23	18	21	18	31	30	27	28	28	34	36	32	33	28	25	21	20	26	12	...		...
Glasgow April	8	6	6	4	7	9	8	7	5	6	6	5	5	5	4	4	2	4	3	4	4	5	4	6	112	5	...
Hawsker August	...	...	1	1	...	1	1	2	1	1	...	...	2	1	2	2	1	...	...	...	1	2	1	...	...		0·44

RAIN GAUGE EXPERIMENTS AT STRATHFIELD TURGISS, READING.

ELEVATION SERIES.

Lat. 51° 20′ 23″ N.; Lon. 1° 2′ 30″ W.; Altitude, 200 feet.

	Ground.	House.		Barn.			Post Gauges.		
Height above ground	D. 8 inch. 4 inches.	Bracket. 39 feet.	Centre. 29 feet.	N.W, side. 11 feet.	Top. 23 feet.	S.E. side. 16 feet.	8 inch. 20 feet.	5 inch. 20 feet.	Apps' 5 in. 3 feet.
1871.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	1·891	1·098	·998	1·776	1·454	1·691	1·701	1·584	1·814
February.....	1·220	·790	·893	1·601	1·176	1·418	1·505	1·470	·947
March	1·034	·554	·689	1·001	·713	·993	·990	·833	1·121
April	3·476	2·928	3·142	3·207	2·888	3·301	3·004	2·979	3·417
May.....	·266	·228	·207	·259	·208	·267	·249	·208	·253
June.....	3·135	2·484	2·890	...	2·589	3·008	2·710	2·697	2·995
July.....	3·706	3·398	3·546	...	3·474	3·599	3·409	3·500	3·690
August	·920	·795	·649	...	·802	·898	·899	·799	·865
September	4·218	3·789	3·921	...	3·849	4·061	4·110	4·054	4·195
October	1·344	1·074	·979	...	1·298	1·661	1·220	1·114	1·224
November	·400	·238	·211	...	·220	·378	·365	·318	·366
December	1·376	·834	1·067	..	1·301	1·688	1·307	1·234	1·223
Totals, 1871	22·986	18·210	19·192	...	19·972	22·963	21·469	20·790	22·110
,, 1870	18·903	13·971	14·284	17·937	14·299	17·826	17·775	16·730	18·039
,, 1869	26·689	19·419	19·598	26·004	20·221	24·303	24·620	23·377	25·556
,, 1868	22·868	17·304	18·315	21·864	18·445	20·249	21·059	20·454	21·957
Ratios, 1871	100·0	79·4	83·6	...	87·0	99·9	93·5	90·5	96·2
,, 1870	100·0	73·8	75·4	94·8	75·6	94·2	93·9	88·4	95·4
,, 1869	100·0	72·9	73·5	97·5	75·9	91·5	92·4	87·7	95·8
,, 1868	100·0	75·7	80·2	95·6	80·8	88·6	92·1	89·5	96·1

C. H. GRIFFITH, *Observer.*

RAIN GAUGE EXPERIMENTS, BOSTON RESERVOIR, ROTHERHAM.

Lat. 53° 25′ N., Long. 1° 20′ W. 381 ft. above the Sea Level.
For the Year 1871.

	Five Mouthed Gauge.					Inclined Rotating Gauges.				
Height above ground.	5ft.					5 ft.				
Months.	Facing East.	Facing North.	Facing West.	Facing South.	Horizon Centre.	22½°	45°	67½°	90°	Tipping
January	·379	·148	·273	·620	·869	1·336	1·442	1·502	1·313	1·223
Feb. ...	·812	·113	·469	1·342	1·594	2·033	2·400	2·203	1·924	2·142
March..	·391	·255	·297	·613	·775	1·219	1·417	1·464	·865	1·386
April ...	1·218	·490	·393	·771	2·511	3·183	3·335	3·007	2·136	3·263
May ...	·266	·325	·089	·277	1·399	1·561	1·374	1·039	·554	1·546
June ...	1·055	·859	·196	·480	3·771	4·211	3·846	2·892	1·537	4·224
July ...	·343	·407	·556	·623	2·854	3·122	2·856	2·145	1·065	3·177
August.	·223	·050	·102	·442	1·333	1·409	1·287	·877	·351	1·406
Sept. ...	3·016	2·501	·295	·235	4·932	6·400	6·503	5·650	4·560	6·674
October	·202	·093	·246	·832	2·167	2·373	2·209	1·553	·710	2·412
Nov. ...	·264	·529	·126	·304	·813	1·155	1·152	1·178	·888	1·218
Dec. ...	·187	·242	·326	·437	1·139	1·392	1·377	1·230	·794	1·377
Totals..	8·356	6·012	3·368	6·976	24·157	29·394	29·198	24·740	16·697	30·048

Elevated Gauges.

Height above ground..... ..	1 ft.			5 ft.			10 ft.		
Months.	Read Daily.	Read Mnthly.	Diff.	Read Daily.	Read Mnthly.	Diff.	Read Daily.	Read Mnthly.	Diff.
January	·906	·852	—·054	·822	·797	—·025	·766	·759	—·007
February.....	1·530	1·480	—·050	1·371	1·339	—·032	1·357	1·292	—·065
March	·858	·825	—·033	·751	·725	—·026	·722	·655	—·067
April	2·597	2·588	—·009	2·461	2·404	—·057	2·391	2·375	—·016
May.....	1·443	1·428	—·015	1·401	1·396	—·005	1·361	1·343	—·018
June	3·826	3·862	+·036	3·728	3·731	+·003	3·665	3·614	—·051
July..	2·986	2·959	—·027	2·814	2·792	—·022	2·721	2·675	—·046
August	1·345	1·337	—·008	1·296	1·300	+·004	1·297	1·289	—·008
September ...	5·191	5·242	+·051	4·918	4·927	+·009	4·909	4·964	+·055
October	2·305	2·303	—·002	2·146	2·135	—·011	2·115	2·105	—·010
November ...	·884	·907	+·023	·831	·898	+·067	·774	·720	—·054
December ...	1·223	1·238	+·015	1·145	1·190	+·045	1·091	1·069	—·022
Totals	25·094	25·021	—·073	23·684	23·634	—·050	23·169	22·860	—·309

ROTHERHAM EXPERIMENTS—(*con.*)

ELEVATED GAUGES—(*con.*)

Height above ground	15 ft.			20 ft.			25 ft.		
Months.	Read Daily.	Read Mnthly.	Diff	Read Daily.	Read Mnthly.	Diff.	Read Daily.	Read Mnthly.	Diff.
January.....	·674	·728	+·054	·712	·711	—·001	·685	·669	—·016
February	1·291	1·320	+·029	1·318	1·308	—·010	1·311	1·282	—·029
March	·693	·694	+·001	·706	·679	—·027	·670	·644	—·026
April	2·336	2·339	+·003	2·326	2·306	—·020	2·326	2·294	—·032
May	1·345	1·372	+·027	1·330	1·345	+·015	1·312	1·293	—·019
June	3·651	3·681	+·030	3·626	3·620	—·006	3·640	3·632	—·008
July	2·512	2·496	—·016	2·666	2·664	—·002	2·591	2·568	—·023
August	1·291	1·294	+·003	1·278	1·297	+·019	1·285	1·275	—·010
September.....	4·850	4·853	+·003	4·762	4·800	+·038	4·783	4·771	—·012
October	2·097	2·099	+·002	2·104	2·077	—·027	2·077	2·028	—·049
November.....	·761	·770	+·009	·726	·740	+·014	·726	·714	—·012
December	1·074	1·085	+·011	1·067	1·064	—·003	1·059	·991	—·068
Totals	22·575	22·731	+·156	22·621	22·611	—·010	22·465	22·161	—·304

R. CHRIMES.

ROYAL OBSERVATORY, GREENWICH.

Lat. 51° 28′ 38″ N. Long. 0° 0′ 0″

Amount of Rain collected in different gauges in each month of the year 1871.

1871	MONTHLY AMOUNT OF RAIN COLLECTED IN EACH GAUGE.							
	Cylinder partly sunk in the ground read mntly	Cylinder partly sunk in the ground. read daily.	Crosley's.	On the roof of the Photographic thermometer shed.	On the roof of the Library.	On the roof of the Octagon Room.	Second Gauge at Osler's Anemometer.	Self-registering Gauge at Osler's Anemomtr
	in.	in.	in.	in.	in.	in.	in.	in.
Jan. ...	2·10	2·05	1·86	2·02	1·50	1·45	1·18	1·08
Feb. ...	1·10	1·09	1·04	1·04	0·82	0·85	0·75	0·60
March	1·07	1·10	1·12	1·09	0·64	0·77	0·51	0·41
April..	2·96	3·03	2·74	2·84	2·36	2·51	2·01	1·95
May ...	0·70	0·68	0·70	0·65	0·63	0·55	0·47	0·45
June...	2·95	2·95	2·82	2·87	2·61	2·56	2·33	2·11
July ...	3·15	3·25	3·23	3·20	2·73	2·55	1·96	1·86
Aug....	0·80	0·86	0·84	0·85	0·70	0·76	0·69	0·69
Sept...	3·96	4·12	3·79	4·17	4·31	3·74	3·68	3·37
Oct. ...	1·50	1·37	1·30	1·35	1·23	1·16	1·07	0·95
Nov ...	0·62	0·57	0·53	0·55	0·47	0·38	0·25	0·18
Dec....	1·30	1·23	1·11	1·12	0·89	0·92	0·72	0·61
Sums..	22·21	22·30	21·08	21·75	18·89	18·20	15·62	14·26

The heights of the receiving surfaces are as follows:

	Above the mean level of the Sea. ft.	in.	Above the Ground. ft.	in.
The two gauges at Osler's Anemometer	205	6	50	8
Gauge on the roof of the Octagon Room	193	2½	38	4½
Gauge on the roof of the Library	177	2	22	4
Gauge on the roof of the Photographic Thermometer Shed	164	10	10	0
Crosley's Gauge	156	6	1	8
The two Cylinder Gauges, partly sunk in the ground ...	155	3	0	5

JAMES GLAISHER, F.R.S.

RAIN GAUGE EXPERIMENTS AT ALDERSHOT CAMP, HAMPSHIRE.

By Colour-Sergeant J. Arnold, A.H.C., F.M.S.

Lat. 51° 15′ 25″ N. Lon. 0° 45′ 36″ W. Height above Sea, 325 ft.

For the Year 1871.

Height above ground	0ft. 0 in	0ft. 6 in	3 ft.	6 ft.		12 ft.	25 ft.	30 ft.	Days on which ·01 or more fell.	Mean amount of horizontal movement of air.
Diameter of Funnel..	8 in.	8 in.	5 in.	5 in.	5 in. tilted at 45°	5 in.	8 in.	5 in. tilted at 45°		
	in.	in.	in.	in.	in.	in.	in.	in.		miles.
January	2·47	2·41	2·31	2·17	3·80	1·92	1·64	3·83	18	238
February	1·50	1·46	1·41	1·33	2·19	1·24	0·99	2·20	15	303
March ...	1·57	1·50	1·46	1·38	2·26	1·23	0·90	2·27	14	263
April ...	3·43	3·31	3·21	3·18	4·50	2·79	2·42	4·42	14	277
May.....	0·62	0·58	0·55	0·52	0·68	0·49	0·45	0·67	8	224
June ...	4·00	3·41	3·75	3·66	3·99	3·47	3·25	3·95	18	211
July.....	3·87	3·76	3·62	3·51	4·85	3·28	2·93	4·81	15	275
August..	1·81	1·80	1·74	1·67	1·98	1·54	1·37	1·92	8	200
Sept. ...	4·48	4·36	4·24	4·14	5·14	4·07	3·62	5·05	12	214
October..	1·90	1·87	1·83	1·74	2·24	1·59	1·51	2·44	16	186
Nov.....	0·50	0·49	0·48	0·49	0·54	0·42	0·37	0·54	12	198
Dec.....	2·03	1·98	1·89	1·80	2·81	1·66	1·44	2·79	17	241
Totals ...	28·18	26·93	26·49	25·59	34·98	23·70	20·89	34·89	167	Mean 236

FOREIGN RAINFALL, 1871.

NOTES COMPILED FROM TELEGRAMS, NEWSPAPERS, &c.,

BY F. E. SAWYER, F.M.S.

ON January 13th there was a great snow-storm at Chicago. In Persia hardly any rain fell during the winter, and none in the spring, and the crops were burned up, causing a severe famine. About the middle of May, there was a great rain-storm at Buenos Ayres, lasting two days. On the 31st of May, an event of rare occurrence took place in South America, there being a heavy fall of rain in N. Chili, in the southern part of the great rainless desert of Atacama, from the coast to the Cordilleras, and from Tres Puntas to Chonarillo (or Chañeral) including Copiapo; it was supposed to be an extension of the rains in S. Chili. About the end of May, a rainy season had set in at Demerara, but Barbadoes continued suffering from drought. On June 23rd the heavy rains which had fallen in the last few days caused floods in the Tyrol, and the railway from Innspruck to Botzen was under water.

The rainfall in India during the year was remarkable. On June 7th a heavy thunderstorm passed over Calcutta; on 17th, much rain reported to have fallen at Calcutta; and in the month the Ganges rose 35 feet in consequence of the rains; throughout July the heavy rain continued in Eastern India; on the 27th it was said to be seriously injuring the indigo crops. The total rainfall at Calcutta up to the 31st of July was 64·24 inches; the average for 17 years being *only* 37·13 *inches*. These heavy rains caused serious floods in the middle of August; the Bombay railway was flooded between Baroda and Ahmedabad. Simla was for some days isolated from the rest of the empire, and the railway from Saharanpore to Umballa was washed away, or flooded for nearly its whole length. On September 2nd, the Eastern Bengal Railway was interrupted through the serious inundations, which continued until the beginning of October. On September 19th, the floods were slightly subsiding, but entire districts were under

water, and all the crops destroyed. When the floods completely subsided it was found that the bed of the Ganges had altered near Shabad, a new channel being formed a mile from the old one. The Hong Kong mail of August 18th brought reports of serious floods at Tientsin, destroying the crops, and causing much loss of life; this, doubtless, arose from the heavy rains which probably extended from the east of India to the north of China. But while Eastern India suffered from heavy rains, the western provinces suffered as badly from drought. A telegram on August 30th, stated that the "Rainfall in Bombay this season is generally less than half an average." On September 19th, the papers report that, "Thanks to the recent seasonable and general fall of rain, the cotton crop is progressing favourably; the north-western provinces were, however, suffering from drought." On September 28th, another telegram says:—"During last fortnight, rain in West and Central India has brought the cotton plants forward. In Ganges Valley excessive rain has caused considerable damage." But little rain, however, fell in Bombay, for on October 21st, we learn that the "light rainfall and long-continued drought are seriously affecting the cotton crops"; and on 28th there are grave accounts as to the imminent failure of the water supply in the Northern Konkan and Guzerat. The Indian papers to November 4th, state that the "rain in last monsoon was very irregularly distributed in Western India, being from 25 to 50 per cent. below the average, while in Bengal and Northern India there was a great excess, causing inundations. In Guzerat the scanty rainfall has left the wells almost dry." From the Cape of Good Hope we hear on July 20th: "There have been heavy rains in the province of Port Elizabeth; much stock lost." At the end of September Constantinople was suffering from a dearth of water owing to the neglect of the authorities in not preparing reservoirs in the spring to collect the rain which fell then. The cholera broke out, and heavy rains were much wanted. In the middle of September, "the drought at Buenos Ayres continued, and was becoming serious to agriculturists and sheep farmers." This was soon altered, for by the middle of October, "rain was general in Buenos Ayres." At Vienna no rain fell from August 26th to September 26th, but on 26th it fell heavily, the rain being general throughout the country. The long and serious drought in Persia was ended by an abundant fall of rain on November 9th, in the northern and western provinces. In Switzerland there was no rain for the last three months of the year, and water in some places was so scarce that high prices

were paid for it. The *Swiss Times* says,—"It has been the general opinion that the weather has gone mad—seized with a kind of hydrophobia."

The weather in Central Europe appears to be very similar to that in the south of England; for when in England in June there were heavy rains, in the Tyrol there were also heavy rains, causing floods. The heavy rains at the end of September, both in England and Austria, appear to be connected. The Swiss drought was also felt, though not to so great an extent in the south of England.

NOTES UPON THE FOREGOING PAPERS.

OUR remarks this year will be very brief. There is perfect harmony between the results of experiments in 1871 and those obtained in previous years, and there is no special novelty. But respecting the true interpretation or explanation of the results a most lengthened discussion has arisen. The statement by Mr. Stow that the "*difference of the angle at which the rain falls is the real cause of the decrease of rainfall upon a horizontal surface with elevation*," was first attacked in the *Meteorological Magazine* by Dr. Burder, and subsequently a most voluminous correspondence has taken place upon the subject. It seems inexpedient to transfer the discussion from a monthly to an annual publication; we have, therefore, merely asked the two parties first concerned in the matter to favour us with articles enunciating their views, and offer no remarks upon them. We regret that Mr. Arnold's experiments seem to have been overlooked in the discussion, because to our own mind they are quite as much to the point as Mr. Stow's. We have not yet seen it explained why gauges whose orifices are set at an angle of 45°, kept face to wind by vanes, should collect the same amount at two such different heights as 6ft. and 30ft. We reprint the following table from our last, adding the values for 1871, and shall be glad to receive an explanation of the discordance between the two sets of observations.

	Horizontal.		Inclined at 45 deg.	
Height above ground	6 feet.	25 ft.	6 feet.	30 feet.
	in.	in.	in.	in.
Total rain in 1869	27·22	20·37	41·59	41·55
,, ,, 1870	22·94	16·51	33·05	32·95
,, ,, 1871	25·59	20·89	34·98	34·89
Ratio of each pair, 1869 ...	100	75	100·0	99·9
,, ,, 1870 ...	100	72	100·0	99·7
,, ,, 1871 ...	100	82	100·0	99·7

The Strathfield Turgiss rainfall experiments may be looked upon as concluded, and the tabular values are this year unaccompanied by any remarks. We notice, however, one feature running through all the series, viz., that the deficiency in the elevated gauges during 1871 is less than in any previous year, and are glad to observe the same fact at Aldershot, where the 25ft. horizontal gauge caught 82 per cent. against 72 per cent. in 1870; at Greenwich, where the gauge at 50ft. collected 70 per cent. against 63 per cent. in 1870, and even at Rotherham, where the 25ft. gauge collected 90 per cent. against 87 in 1870, thus showing that however incorrect the indications of elevated gauges may be, they are consistent not only within small distances but even over large tracts of country.

We are sorry to find that Mr. Sawyer has not met with any *collaborateurs* in his investigations of Hourly Rainfall. Last year we wrote as follows:—

"We have on previous occasions urged the importance of assisting Mr. Sawyer in his investigations; we venture once more to press it upon our readers. In Scotland it is a regular practice to record the duration of sunshine; surely it would not be much more difficult to record approximately that of rain. We hope that some of our correspondents will communicate with Mr. Sawyer."

What more could be said? There is, however, hope for accessions of material of the best class in the establishment of several self-recording rain gauges in different parts of the country.

ON THE SECULAR VARIATION OF RAINFALL IN ENGLAND SINCE 1725.

(*Continued from "British Rainfall," 1870, p. 57.*)

PART II.

Considerations which in any inquiry as to the annual fluctuation of rainfall should govern the selection of the standard of comparison.— It is tolerably evident at the outset that the three leading requirements are (1) the longest series; (2) the most accurate series; (3) the series during which the geographical representation of the whole area concerned was most complete. Now, these three requirements are, as regards rainfall observations, entirely at variance. It is doubtful if the first two do not clash, and it is certain that the first and third are diametrically opposed. Until within the last twenty or thirty years nothing that could be called a geographical representation of the rainfall of the British Isles could be compiled, or can be, even now that the old observations are mainly collected. While, therefore, condition the first could be met by complete registers exceeding half-a-century in duration, these records altogether failed to meet condition the third. It has also to be borne in mind that to a certain extent the subject has a tendency to divide into two branches. We require some synchronous period of moderate duration common to a widely-spread number of stations, in order to discover what may be called local irregularities of distribution. Let us illustrate our meaning on this head by an example of this sort of question, which is one that constantly arises. Observations were only made at Hartland, North Devon, during one year, 1864, when the total fall was 22·79. What is, most probably, the mean annual fall at that place? Now, if we attempt to answer this question by saying that over the whole of England the fall in 1864 was 17 per cent. below the average, we shall evidently not be so likely to be correct as if we can find what the deficiency was in the

vicinity of Hartland. Investigations (which need not here be reproduced) show that in Devonshire and Cornwall the real deficiency was about 23½ per cent. Therefore if we had not had these widely-spread stations we should have taken 17 per cent., which would have given the mean annual fall for Hartland at 27·45, instead of 23½ per cent., which would have given 29·79 inches.

The other branch is the altogether different problem of the fluctuation in the total fall of rain over the whole country, and this is one which may be determined with a smaller number of stations.

In the present article we shall (1) recount the steps we have taken in previous volumes of this work to supply this need; (2) we shall indicate the relation which the various periods bear one to another, and (3) the plan which seems to us the best to adopt for many years to come.

For convenience, and brevity of reference, we shall prefix a numeral to each separate statement or investigation.

(I.) In the first volume (if such a term may be applied to a modest pamphlet of some twenty pages) of *British Rainfall*, viz., that for 1860–61, on page 5, will be found this sentence—

"In the following brief remarks, the mean of the ten years, 1850 to 1859, has been adopted as a standard of reference; the fall in those years being within about five per cent. of the average during the last half-century; and a larger number of the existing stations being complete for that period than for any other."

This statement was unaccompanied by any evidence or indication as to the data upon which it was based, and, during the lapse of more than ten years, it has slipped our memory, but it is of little moment. It seems to have been drawn up mainly with reference to geographical distribution (condition 3 *supra*), but conditions 1 and 2 were evidently not neglected, and subsequent enquiry has proved it to be remarkably correct.

(II.) In *British Rainfall*, 1862, a table is given showing the mean fall during the decade 1850—9, and the difference between that mean and the fall in each of the three years, 1860, 1861, and 1862; but there is no reference to the relation which the 1850—9 decade bears to any longer average.

(III.) In the *British Association Report* for 1862, will be found the following paragraphs and table:—

"The next point for consideration is the relation which subsists between the fall in the two years, 1860, 1861, and the average of a long series of years.

"A large number of the gauges having only been in use for ten or fifteen years

it was found necessary to adopt, as a standard of comparison, the fall during the ten years, 1850 to 1859. The fall during this period appears from Table II. to be very suitable for the purpose, as the amount during it was generally within five per cent. of the average fall during the last fifty years."

TABLE II.—*Difference between Mean Rainfall as obtained from long series of years, and from the ten years* 1850 *to* 1869.

Division	Name of Station.	Period of Observation.	Total Number of Years.	Mean of the whole period.	Mean of ten years, 1850-1859.	Difference per cent.
				inches.	inches.	
II.	Greenwich	1815-61	47	25·42	23·16	9
V.	Exeter, St. Thomas's ..	1814-61	48	32·80	31·15	5
VI.	Orleton	1831-61	31	29·18	28·82	1
VIII.	Bolton-le-Moors.....	1831-61	31	46·92	44·10	6
IX.	Halifax	1829-61	33	32·38	30·71	5
XV.	Rothesay.....	1800-61	62	48·31	45·97	5

This is the first publication of evidence in support of the assertion already quoted from our first pamphlet. It differs from any of the calculations hereafter to be noticed in the fact that the long periods are not synchronous, their length being supposed to be sufficient to render attention to that point unimportant.

(IV.) The next step is described in *British Rainfall*, 1865, Appendix page xii., and also (with a diagram) in the *British Association Report* for that year. The following are the more important paragraphs:—

"*A few particulars respecting the rainfall of the last fifty years and the fall in* 1864. And first, with reference to the fall during the past half-century, to an examination of which I gave some little attention during the last spring. The accompanying diagram best explains the result of this temporary investigation. I wish to emphasize the word temporary very strongly, because one can never be sure that a partial investigation, based on a few records, yields the same result as if all were combined, as I hope eventually to do, when, instead of discussing the variation in half-a-century, we may hope to discuss the records of two centuries. Unfortunately there are very few continuous records extending back more than about thirty years. A few, however, are available, and having carefully interpolated for one or two missing years, I have been able to form the following table from the mean of ten widely separated stations, one in each of the following counties:—Devon, Kent, Middlesex, Surrey, Essex, Lincoln, Lancashire, York, Edinburgh, and Argyll.

"It may be well to add, that on carrying the examination back to 1800, the fall seems to have been less than it was about 1815, when the following more reliable Table commences."

It is unnecessary to reprint this table, as it has been subsequently incorporated in another investigation hereafter to be described, but

the relation of the fall in each decade to that of the whole period has not hitherto been computed; it is as follows:—

Mean fall	1815 to 1864	=	28·20 in.	=	100·0
,, ,, ...	1820 to 1829	=	28·46 in.	=	100·9
,, ,, ...	1830 to 1839	=	28·85 in.	=	102·3
,, ,, ...	1840 to 1849	=	28·56 in.	=	101·3
,, ,, ...	1850 to 1859	=	26·47 in.	=	93·9

(V.) In *British Rainfall*, 1865, Appendix page xiii., is a table showing that the deficiency during the decade 1855—64 was by no means equal throughout the country, and in the *British Association Report* for that year an attempt at tracing the areas of maximum and minimum deficiency is made, but as this is rather foreign to our present subject we will not pursue it.

(VI.) In *British Rainfall*, 1865, there is on pages 30, 31, a very elaborate table, the result of much work, and yet, strange to say, it is unaccompanied by a word of comment. The contents of the table are thus succinctly explained in the head line, "Comparison of the Mean Rainfall in the ten years 1850—59, with that of the six years 1860—5, and also of the fall in 1864 and 1865, with the ten years 1850—59." That is precisely what is given; the means for both the ten and the six year period are given, and so is the difference between them, but the per-centage of difference has not been computed, and there is no information as to the relation of the two periods beyond that which may be gathered from the run of + and − signs, and the differences of fall. But, as is hinted in a foot note, and self-evident (although other writers do not seem to notice it, or dislike the extra work it involves), the per-centage of difference should always be computed. Now, a difference of 10·00 in. at Seathwaite, is of much less importance than a difference of 10·00 in. at London; in the former case it would mean a departure from the average of about seven per cent., or one-fourteenth, and in the other of more than forty per cent., or nearly one-half.

The six year averages (1860–65) were, we believe, originally computed for a new edition of "*Petermann's Hydrographical Map of the British Isles*," and they have also been used as a standard of comparison in the monthly tables given in the *Meteorological Magazine*. Under all these circumstances it will probably be wise to complete the table by now computing the per-centage differences at the whole of the ninety-four stations, and we, therefore, give the results in the following table:—

Ratio of Mean Rainfall during the six years 1860–65 *to that of the ten years* 1850–59, *the latter being taken as* 100·0.

ENGLAND.

Div.	Station.	Ratio for 1860-65.
I.	Chiswell Street	107·7
II.	Cobham	108·6
,,	Chichester	108·7
,,	,, (Shopwyke).	108·2
,,	,, (West Dean)	104·9
,,	Ventnor	102·8
III.	Hemelhempstead	96·4
,,	Hitchin	94·1
,,	Oxford	95·6
,,	Banbury	100·1
,,	Althorp	107·0
,,	Cardington	101·3
IV.	Epping	103·8
,,	Witham	100·9
,,	Norwich	93·5
,,	Honingham	89·6
,,	Burnham	96·7
,,	Holkham	88·4
V.	Baverstock	103·1
,,	Goodamoor	105·9
,,	Exeter Institution	112·1
,,	Clyst Hydon	103·1
,,	Bradninch	107·2
,,	Broadhembury	104·7
,,	Helstone	105·0
,,	Bodmin	106·1
,,	Swanswick	95·8
VI.	Cirencester	104·3
,,	Burford	102·9
,,	Haughton Hall	98·8
VI.	Orleton	104·3
VII.	Wigston	100·4
,,	Welbeck	103·1
,,	Derby	104·8
VIII.	Bolton-le-Moors	109·8
,,	Belmont	108·8
,,	Rufford	104·7
,,	Preston (Howick)	111·1
,,	,, (Fishwick)	115·4
,,	,,(House of Correction)	109·5
,,	Stonyhurst	108·2
,,	Holker	114·8
,,	Coniston	120·4
,,	Wray Castle	112·2
IX.	Redmires	100·8
,,	Standedge	105·2
,,	Ackworth	97·5
,,	Halifax, (Well Head)	101·2
,,	Leeds, (Marshall & Co.)	105·1
,,	,, (Eccup)	98·8
,,	,, (Manor Road)	97·1
,,	Settle	111·9
,,	York	106·2
X.	Bishopwearmouth	125·1
,,	Seathwaite	120·9
,,	Keswick	110·1
,,	Kendal	117·8
,,	Troutbeck	124·2
XI.	Guernsey	107·6

SCOTLAND.

XIII.	Haddington	110·6
,,	Thurston	109·9
,,	Glencorse	99·5
XIV.	Bothwell Castle	102·0
,,	Mansfield	113·0
,,	Brisbane	113·7
XV.	Castle Toward	112·2
,,	Lismore	122·1
,,	Ardnamurchan	124·5
,,	Hynish	114·7
XVI.	Isle of May	138·8
,,	Deanston	108·0
,,	Stanley	105·3
,,	Craigton	111·8
,,	Hill Head	114·6
,,	Seichen	115·0
XVII.	Girdleness	112·3
,,	Castle Newe	104·9
,,	Buchanness	96·2
,,	Kinnairdhead	105·8
XVIII.	Cromarty	117·5
,,	Barrahead	99·8
,,	Island Glass	74·9
XIX.	Cape Wrath	107·2
,,	Noss Head	92·2
,,	Dunnet Head	117·4
,,	Pentland Skerries	119·9
,,	Sandwick	101·8
,,	Start Point	121·7
,,	Sumburghead	101·2
,,	Bressay Manse	111·6

IRELAND.

XX.	Portlaw	116·2
,,	Killaloe	121·8
XXI.	Black Rock	118·6
XXIII.	Belfast Linen Hall	123·6

ABSTRACTS.

Mean ratio for each Division.

Div. I	107·7	Div. VIII.	111·5	Div. XVI.	115·6
,, II	106·6	,, IX.	102·6	,, XVII.	104·8
,, III.	99·1	,, X.	119·6	,, XVIII.	97·4
,, IV.	95·5	,, XI.	107·6	,, XIX.	109·1
,, V.	104·8	,, XIII.	106·7	,, XX.	119·0
,, VI.	102·6	,, XIV.	109·6	,, XXI.	118·6
,, VII.	101·8	,, XV.	118·4	,, XXIII.	123·6

*Mean ratio for England, Scotland, and Ireland, and for the whole of the British Isles.**

	Divisional.	Aggregate.
England	105·4	105·3
Scotland	108·8	109·7
Ireland	120·4	120·0
British Isles	111·5	107·4

Although the mean deficiency in England during the ten years, 1850–9, was about five per cent., the deficiency varied at different stations and in different districts. Hence (irrespective of its shortness) this period is evidently unsuited for a standard of comparison, and hence, to a certain extent, the irregularities in the foregoing table.

Another form of attacking the problem is adopted in an article in the *Proceedings of the Meteorological Society for February*, 1866, where, in a table dealing partly with other matters, the mean rainfall at certain stations is given for the three decades, 1830–39, 1840–49, and 1850–59. These averages are grouped as follows :—

(VII.) From stations complete for the thirty years, 1830–59 :—

	Depth.			Ratio (1830-59 =100)		
Stations.	1830-39	1840-49	1850-59	1830-39	1840-49	1850-59
	in.	in.	in.			
Eight English Stations.	30·20	29·45	27·23	103	102	95
Six Scotch ,,	27·12	27·27	24·49	103	104	93
Fourteen British ,,	28·66	28·36	25·86	103	103	94

* Owing to there only being four Irish returns, and they uniformly large, the difference between the Divisional and aggregate means is unusually great. We, therefore, give both. It may not be superfluous to explain that by the term Divisional is indicated the means obtained from the mean ratios for Divisions I. to XI. for England, XIII. to XIX. for Scotland, and XX. to XXIII. for Ireland, and then taking the arithmetical mean of the values thus obtained for the British Isles. The aggregate means are obtained from the whole of the individual entries in each country, irrespective of Divisions, and, finally, from all the entries, irrespective of countries.

(VIII.) From stations complete for the twenty years, 1840–59 :—

Stations.	Depth. 1840-49	Depth. 1850-59	Ratio (1840-59 = 100) 1840-49	Ratio (1840-59 = 100) 1850-59
	in.	in.		
Twenty-two English Stations.....	31·52	29·48	103	97
Nineteen Scotch ,, ...	29·52	27·72	103	97
Forty-one British ,, ...	30·52	28·60	103	97

(IX.) Our next investigation of the question is contained in the *British Association Report* for 1866, and is therein thus described :—

(1.) Eight of the longest and most complete registers were selected, most being for periods of over fifty years, viz. :—

	Period.	Years.
Southwick, near Oundle, Northampton, G. Lynne, Esq.	1726–1739	14
Lyndon, Oakham, Rutland, T. Barker, Esq. ...	1737–1798	62
Chatsworth, Derbyshire	1761–1813	53
Manchester, Lancashire, Dr. Dalton	1794–1840	47
Derby, Derbyshire, Mr. Swanwick	1809–1835	27
Radcliffe Observatory, Oxford...	1815–1865	51
Cobham Lodge, Surrey, Miss Molesworth... ...	1825–1865	41
Mean of ten stations, as given in 1865 report ...	1815–1865	51

(2.) The mean of each set of observations having been taken, the fall in each year was divided thereby, and thus its relation to the mean of the whole period was converted into a ratio independent of the amount of fall.

(3.) These values being, therefore, strictly comparable, have been tabulated in parallel columns, and in order to connect all together, and to reduce all to one uniform base, the means were taken of each overlapping portion and the corrections thereby deduced having been applied, the ratios were thus reduced to the following bases :—mean of 51 years at Oxford ; mean of 51 years at the ten stations quoted in the 1865 report, and mean of 41 years at Cobham Lodge."

These explanations are followed by a large sheet of computations, which need not be reproduced here, nor need the results, since they will come again under notice.

(X.) In *British Rainfall*, 1867, pp. 74, 75, the mean rainfall during the ten years, 1840–49, at thirty-seven stations is tabulated along with that at the same stations during 1850–59 and 1860–65, but without any comments bearing on the subject now before us.

(XI.) In *Rain, How, When, Where, Why it is Measured*, page 51, the following paragraph occurs :—

" From various calculations, some of which may be found in my different publications, it appears that the fall of rain during the ten years 1850 to 1859 inclusive, was about 5 per cent. *less* than during the previous forty years ; from others it appears that the fall during the six years, 1860 to 1865, was four or five per cent.

above the mean of the ten years 1850 to 1859. Therefore the average, 1860–65, was obviously very nearly the same as during the forty years, 1810–49, and surely 40 years should give a tolerably correct average. We shall, therefore, not probably be very far in error if we take the mean of those six years as representing the true mean fall at the places of observation."

(XII.) The only important subsequent contribution to the subject is the article (of which this is the sequel) in *British Rainfall*, 1870, which being probably on most of our readers' shelves, requires no lengthened notice here, but just a few words of epitome, and of explanation in one or two cases. The first point is to explain how the values originally given in the *British Association Report*, 1866, as the ratios of the fall in each of a long series of years to the "mean of fifty-one years, 1815–65," can be identical with those in *Rainfall*, 1870, which are stated to be the ratios of each of the same series of years to the "mean of sixty years, ending with 1869." The explanation (as can be verified from the table itself) is, that the two periods differ considerably less than one-half per cent., they may, therefore, of course be considered as practically identical, and as most of these calculations have been made for decades beginning with the year 0, the latter is preferable to the former. The following are the ratios for each decade:—

Mean ratios in groups of ten years each from 1730 *to* 1859 (*mean of sixty years*, 1810–69 = 100·0).

1730–39	= 89·9	.....	1800–09	= 88·2
40–49	= 70·6	.....	10–19	= 98·6
50–59	= 85·5	.....	20–29	= 103·2
60–69	= 91·1	.....	30–39	= 101·4
70–79	= 103·5	.....	40–49	= 102·6
80–89	= 93·5	.....	50–59	= 95·2
1790–99	= 96·5	.....	1860–69	= 101·5

(XIII.) The same article contains in the following two lines—

Periods ...	1800–9	1810–19	1820–9	1830–9	1840–9	1850–9	1860–9
Ratios ...	91·8	99·2	104·8	101·4	100·7	93·0	100·9

the result of twenty sets of observations, none of which are of less than twenty years' duration, and several of them more than half-a-century without a single interruption. The ratios refer to the sixty-year standard, 1810–69.

This closes the first or historical portion of this article, except that in order to simplify the second part, and avoiding perpetual reference, we shall now present the facts already stated in the most condensed form possible.

(III.) *British Association Report*, 1862, shows that, assuming the mean of forty-two years ending with 1861 as 100·0, the fall during the decade 1850–59, was 94·8.

(IV.) *British Rainfall*, 1865, shows that on the evidence of ten selected stations it appears that (assuming the fall 1815-64 as 100·0) the following are the ratios of the under-mentioned decades :—

1820–9	1830–9	1840–9	1850–9
100·9	102·3	101·3	93·9

(VI.) *British Rainfall*, 1865, shows that the fall during the six years, 1860–65, exceeded that in ten years, 1850–59, (on the evidence of nearly 100 stations) in England by 5·4 per cent. ; in Scotland by 8·8 ; and in Ireland by 20·4, and in the British Isles, as a whole, by 11·5 per cent.

(VII.) *Proceedings of Meteorological Society*, 1866, shows that on the evidence of the undermentioned number of stations (assuming the fall, 1830–59, as 100·0), the following are the ratios of the undermentioned decades :—

	1830–9	1840–9	1850–9
Eight English Stations	103	102	95
Six Scotch ,, ...	103	104	93
Fourteen British ,, ...	103	103	94

(VIII.) And secondly (assuming the fall 1840–59 as 100·0,) the following ratios are deduced :—

	1840–9	1850–9
Twenty-two English Stations	103	97
Nineteen Scotch ,, ...	103	97
Forty-one British ,, ...	103	97

(XII.) *British Rainfall*, 1870, mean ratios (deduced from "*British Association Report*, 1866,") of each decade to mean of sixty years, 1810–69.

1730-9 = 89·9 ..	1780-9 = 93·5 ...	1830-9 = 101·4
40-9 = 70·6 ...	90-9 = 96·5 ...	40-9 = 102·6
50-9 = 85·5 ..	1800-9 = 88·2 ...	50-9 = 95·2
60-9 = 91·1 ...	10-9 = 98·6 ...	1860-9 = 101·5
1770-9 =103·5 ...	1820-9 =103·2 ...	

(XIII.) *British Rainfall*, 1870, mean ratios (deduced from twenty long registers) of each decade to mean of sixty years, 1810-69.

1800–9	1810–9	1820–9	1830–9	1840–9	1850–9	1860–9
91·8	99·2	104·8	101·4	100·7	93·0	100·9

It next becomes our duty to examine the mutual relation of the various periods. We laid it down at the commencement of this part of the article that the first requirement in an investigation of secular change was length of series. It is evident that the various periods can be compared most easily and intelligibly by adopting some one as a standard and comparing all with it. The joint requirements of accuracy and length of series are, we believe, best met by the period of sixty years between 1810 and 1869, and for this we have two sets of values obtained by altogether dissimilar methods. Denoting their source by the numerals already referred to, and correcting the values from calculation XII. for the fractional error mentioned on page 65, we have—

Period.	1810–19	1820–29	1830–39	1840–49	1850–59	1860–69	1810–69
XII.	98·2	102·8	101·0	102·2	94·8	101·1	100·0
XIII.	99·2	104·8	101·4	100·7	93·0	100·9	100·0
Mean.....	98·7	103·8	101·2	101·4	93·9	101·0	100·0

and accepting these values as our standard of comparison we have

Period.	1820–29	1830–39	1840–49	1850–59
III.	...	...	...	+0·9
IV.	−2·9	+1·1	−0·1	0·0
VII.	...	+1·8	+1·6	+0·1
VIII.	...	...	+1·6	+4·1

This table shows in a very clear manner the disturbing influence of the dry decade, 1850–9, in all inquiries not extending over a long period, but this is such a natural and obvious effect that it is almost superfluous to call attention to it. Dismissing computation VIII. as invalid, on the ground of insufficient length of series, the others are in closer accord than might have been expected, and hence we see no present reason to think that any change in our standard of comparison is required.

Lastly, we have to consider the best plan to adopt for the future. This has to a great extent been indicated in the remarks and reasoning already submitted. It appears to us that for questions of secular variation it will be desirable not to deviate from the standard of 1810–69, not even when one, or even two, subsequent decades can be added. Permanence—definiteness—and uniformity are of infinitely more importance than improving the standard by a few tenths per-

cent., especially since our last century experience shows that a subsequent decade may compel it to be altered back again.

For questions of local distribution there seem to be two opposite arguments (1) that whatever standard of comparison has been in use should be retained; (2) that the standard should be continually changed so as to include the largest practicable number of existing stations. There is so much to be urged on behalf of each proposition that we confess to an inclination to agree with both, although that would involve double work and double expense. Whatever be the standard adopted, its relation to the major standard, 1810–69, should always be distinctly stated.

ON THE RAINFALL OF CERTAIN DISTRICTS.

DARTMOOR.

We expressed last year the opinion that in securing tolerably complete returns from Dartmoor for 1870, we had probably gained an important series of records for one of the driest years likely to be experienced for some time to come.

This opinion is greatly strengthened by the returns for 1871, several of which are more than half as large again as those for 1870, and some of them nearly double the 1870 amount—and this has not arisen from 1871 being a very wet year. Looking at our usual comparison table, and collating various facts, we think it may be safely assumed that in no part of the Moor was the fall in 1871 ten per cent. above the mean, and that generally it may be taken as seven per cent. in excess. Starting with this strongly supported hypothesis we will proceed to ascertain the correctness, or otherwise, of the opinions submitted last year, and this will most easily be done in a tabular form :—

Observed and Estimated Rainfall on Dartmoor.

Station.	Fall in 1871.	Mean fall assuming that in 1871 =7 per cent. in excess.	Fall in 1870.	Difference between 1870 and computed mean	
				Amount.	Per cent.
	in.	in.	in.	in.	
Pentillie	50·34	47·08	36·02	11·06	24
Lee Moor	70·65	66·02	40·49	25·53	39
Sheepstor	56·21	52·55	44·59	7·96	15
Callington	54·54	50·97	40·89	10·08	20
Hingston	59·51	55·60	46·91	8·69	16
Tavistock	51·88	48·50	36·89	11·61	24
,, West Street	53·40	49·88	37·40	12·48	25
,, Mount Tavy	50·47	47·13	31·91	15·22	32
Prince Town Reservoir	69·38	64·87	46·95	17·92	28
,, ,, Gardens	79·36	74·20	54·70	19·50	26
,, ,, Rundlestone	74·04	69·20	52·35	16·85	24
Holne Vicarage	70·05	65·48	52·33	13·15	20
Ashburton	52·15	48·74	38·89	9·85	15
Widdecombe	59·87	55·96	33·26	22·70	41
Ilsington	41·32	38·58	29·15	9·43	24
Endsleigh	51·51	48·11	41·06	7·05	15
Launceston	47·33	44·24	41·61	2·63	6
Coryton	46·93	43·85	38·26	5·59	13
Chagford	45·07	42·14	27·18	14·96	36
Okehampton	45·68	42·70	33·78	8·92	21
Clawton	34·14	31·89	28·16	3·73	12
N. Lew	42·10	39·36	28·89	10·47	27
Jacobstowe	37·65	35·18	26·80	8·38	24
Zeal Monachorum	41·10	38·40	30·76	7·64	20

According to this table the deficiency in 1870 amounted on the average to 23 per cent., which was slightly less than the deficiency in the South-Western district, which averaged 27 per cent. But, as pointed out in our last, some stations on the Moor had in 1870, "a deficiency of nearly if not quite 40 per cent." The foregoing table shows that the supposed ordinary limit of fluctuation, 33 per cent., was exceeded at Lee Moor (39 per cent.); Widdicombe (41 per cent) and Chagford (36 per cent.), and it also corroborates the remark we have just quoted.

We are sorry to say that we have no tidings of the establishment of a gauge near Cranmere Pool, and that our correspondent at the Powder Mills has "gone away, and left no address." A new station on the road between Prince Town and Chagford would be useful. We are glad to welcome one new one at Grendon, somewhat to the south of this line, and between it and Widdicombe.

DERBYSHIRE.

The principal items to be noticed under this head are the receipt of complete returns from the new stations of Castleton, Burbage House, Mam Tor, and Bamford, in the northern part of the county, and from Ripley and Willersley, in the centre, and imperfect ones from the recently established stations of Poole's Cavern and Brassington. The observations at Edale Vicarage have, unfortunately, been interrupted by the death of the observer, and we are thus still left without any returns from the district immediately surrounding the Peak, although we are gradually closing around it.

ENGLISH LAKE DISTRICT.

We are unable to give any definite information respecting the Western district, where the observations used to be made under the direction of Mr. Fletcher, M.P., inasmuch as we have received no reply to several communications addressed to that gentleman, and we are quite unaware whether the observations are continued or not. We have at our own expense arranged for the continuance of observations at Seathwaite; and the Eastern mountain, and other stations have been maintained, with only trifling interruption. We have been favoured, through Mr. Arthur Marshall, of Hallsteads, with a most valuable return, viz., one from Martindale Parsonage, south of Ullswater.

ON THE BORDERS.

Mr. Wheeler, as we anticipated, has been tolerably successful now that he has taken the Cheviot stations under his own control. This year, for the first time, we have reports from Kielder and Falstone on the English side, and Saughtree on the Scottish side. We believe that Mr. Wheeler is endeavouring to render the series more complete, and we hope he will succeed. We understand that the records taken round St. Mary's Loch for the Edinburgh Water Trust have been discontinued; this is to be regretted, not only for scientific reasons, but because, sooner or later, the information would have possessed an actual money value far exceeding the cost of registration. We do not intend to digress into engineering or financial questions, but we cannot refrain from expressing our surprise at the frequent display of niggardliness in such matters, considering how often it compels tenfold subsequent outlay.

WALES.

We have already drawn attention to the collapse of the Carmarthenshire stations during last year, which not having been reported until 1872 was far advanced, will of course affect 1872 as well as 1871. We hope that all who can assist in remedying this deficiency will communicate with us as soon as possible. As to the rest of the Principality there is nothing special to report; a few returns are missing, and among them unfortunately, Lampeter, one of the oldest and most important stations in Wales. On the other hand, there are about half-a-dozen new ones, among which perhaps the most important are Tenby, Heyhope, and Pen-y-gwyrd.

OBITUARY.

Subjoined is the list of contributors to *British Rainfall* removed from us by death since our last notice. It will be seen that with few exceptions they had only of late years been observers. Mr. Denny has the longest period assigned to him, but it is not quite certain that the earlier portion of the records was kept by him; if not, then Dr. Fielding's record is the oldest. In addition to the above, who were regular contributors to these pages, all meteorologists must regret the loss in one year of two such able men as Keith Johnston and Robert Russell, of Kilwhiss.

	Period of Observation.
Bolton, Jasper, Esq., Ballykistreen, Tipperary	C 1865—1869 T
Boorman, E., Esq., The Shrubbery, Boxhill, Surrey	C 1864—1870 T
Boorman, E., Esq., Church House, Salehurst, Sussex	C 1864—1870 T
Champion, Rev. J., Edale Vicarage, Derbyshire	C 1871 imp T
Coleman, R. Esq., South Fields, Wandsworth, Surrey	C 1861—1870
Dalziel, P. Esq., Waterside, New Galloway, N.B.	C 1865—1869 T
Denny, H. Esq., Philosophical Institution, Leeds	C 1823—1863 T
Fielding, G. H., Esq., M.D. Maidstone	C 1848—1857 T
Fielding, G. H., Esq., M.D. Tunbridge	C 1861—1870 T
Freeman, D. A., Esq., Upper Tooting, Surrey	C 1867—1871
Gillett, Rev. G. E., Waltham Rectory, Melton Mowbray	C 1860—1870 T
Gresson, W. Esq., Clonbrin, Rathangan, Ireland	C 1863—cont.
Hadden, J. A., Esq., Bittacy House, Mill Hill, Hendon	C 1866—1870 T
Llewellyn, D. M., Esq., West End Terrace, Llanelly	C 1867—1870 T
Paterson, J. W., Esq., Ballater, Aberdeenshire	C 1861—1871
Spedding, J. J., Esq., Mirehouse, Bassenthwaite, Keswick	C 1854—cont.
Turner, Rev. E., Maresfield Rectory, Sussex	C 1857—1870 T
Walker, Mr. W., Wythburn, Windermere	C 1866—cont.

RAINFALL AND METEOROLOGY

OF

1871.

ON THE METEOROLOGY OF 1871,

WITH NOTES OF SOME OF THE PRINCIPAL PHENOMENA.

[These Notes should be read in conjunction with those on Heavy Falls in 1871, on page 124.]

JANUARY.

1st. The lowest temperature of the year at several stations, *e.g.*—V. *Trowbridge (Sunnyside)*, 11°.—X. *Kirkby Lonsdale (Casterton)*, 12°, and XI. *Trevalyn Hall, Rossett, Denbigh*, 9°·8. Our correspondent at XVI. *Leny, Callander, Perthshire*, reports, "The heaviest fall of snow that has occurred here for many years. Its depth was 22 inches, and it broke a great many branches of trees, especially of Scotch firs, showing that they were not meant for such falls of snow; Norway spruce stood it without a broken branch."

From the 1st to 13th inclusive frost generally prevailed, but gave before a S.W. current on the latter date.

15th. Violent S.W. gale, of which we have the following notes:—V. *Court Barn, Holsworthy.* An unusual storm of wind from S.E., commencing about 7 p.m., and lasting all night. *Kilworthy Hill, Tavistock.* Heavy rain from S.W. *Sunnyside, Trowbridge.* Violent gale, and lowest barometric reading of the year, viz., 28·50 at 32°, but not reduced to sea level. *Taunton.* Very heavy gale at night.—IX. *Middlesborough.* Gale from S.E.; very low barometer.—XV. *Ballachulish.* Strong S.W. gale, with snow showers.—XXII. *Ballinasloe.* Severe gale from S.E., commencing at 9 p.m., of great intensity, but short duration.

Inisnag, Stoneyford, Kilkenny.—Perhaps some particulars of a very remarkable squall, I can hardly call it a storm on account of its brief duration, which occurred here on the night of Sunday, January 15th, may be worth placing on record. The morning broke blustery, after unsettled, stormy weather on the 13th and 14th. The barometer, which stood at 30·07 on the 12th, had been steadily falling, and stood at 29·00 at 9 o'clock a.m. on the 15th. The thermometer registered

55° max. on the 13th, 14th, and 15th; minimum, 47° on 13th to 43° on night of 15th. Except the falling barometer, there seemed no indication of a gale, and the sunset was rather fine; however, shortly after 6 p.m. the wind freshened, and by 9 p.m. was blowing a gale, with heavy, driving cumulo stratus, but as yet, no rain. About 9, the rain came on, and the wind at 10 p.m. blew a perfect hurricane, lulling at times, and then coming up in thunderous gusts, which roared and growled round the house, which is fully exposed to a gale from the S., S.W., and W., being situated on a table land. The wind was then due S., and continued so during the most violent period of the squall. I retired to bed (but not to sleep, for that was impossible) about 20 minutes after 10, and it may serve to indicate the violence of the noise caused by the roaring of the storm, to say, that I was totally unconscious of the carrying away of the heavy 5-inch eave-shoots (which were supported on iron hooks screwed to a facia board) round two sides of the house forming the walls of my bed-room. These shoots must have been acted on by the force of the wind deflected by the walls and directed upwards. The force requisite to lift from their hooks these metals, which were round at bottom, must have been very great, and may serve as a sort of gauge of its violence; unfortunately, I do not possess an anemometer. From 9 o'clock till to 20 minutes after 10, the fall of the barometer was rapid, reading 28·29 at 10.20 p.m. Some of my neighbours declare that the gale was accompanied by thunder and lightning, but though I watched for the flashes, I saw none. I should say that thunder would be inaudible above the noise of the wind. Shortly after 11, the wind shifted to S.W., with torrents of rain and a heavy hail shower, and veering further, settled in the W. before morning, the barometer reading 28·40 at 9 a.m. on the 16th. I was surprised to find how little injury to trees or houses was caused by this storm in the country round me. In Dublin, the *Daily Express* newspaper of the 17th, gives the following account of the gale:—

"Shortly after nine o'clock on Sunday night, heavy rain fell, and continued up to eleven, when a terrible squall from S.W. broke over the city, accompanied by a deluging downpour, which had the effect of clearing the streets of pedestrians. No injury of any important character has been reported beyond that done to chimneys, save in one instance relating to the house No. 6, Lower Rutland Street, a portion of which fell, shaking the whole building so much that the approaches to it had to be guarded by the police, to prevent accident. Few or none of the small Irish coast fishing boats were out when the storm arose, owing to the fact that it was Sunday night. In the city we could learn of no loss to human life save that of a wretched woman, who met her death under the following painful circum-

stances:—About 12 o'clock, when the storm was at its height, an unfortunate woman, who lived at 9, Bull's Lane, Eliza Healey, was walking on the banks of the Royal Canal, which she was in the habit of doing nightly. Francis Duffy, Phibsborough, who was proceeding home, states that a blast of great force seized the unfortunate woman and hurled her into the canal, where she immediately disappeared."

The same paper supplies these items from the country :—

"*Nenagh.*—A terrific storm swept over this town last night. From seven o'clock up to an early hour this morning the storm raged with great fury, accompanied by showers of rain, which fell in such torrents as to flood several fields in the neighbourhood to the depth of several feet. Roofs of houses were stripped, trees torn up by the roots, and the windows of several houses were blown in. Some snow fell this morning, and the air is piercingly cold to-day."

"*Wexford.*—It blew a fearful gale here last night from the W.S.W., and great fears are entertained that many casualties may have happened to shipping along this treacherous coast; but, with the exception of the stranding of the fine iron ship, the Wayfarer, of Liverpool, no loss has yet been reported. The Wayfarer came to anchor near the Great Saltee Island on Saturday morning, and as the Wexford tugs were unable to proceed to her assistance, the weather being so bad, Mr. J. Walsh, Lloyds' agent here, yesterday telegraphed to the owners to send on a powerful steam tug from Liverpool; but at one o'clock to-day, he received a message that the ship had parted her cables, and was ashore on the quay of Kilmore."

"*Limerick.*—This city was visited last night with a terrific gale. About eight o'clock in the evening, the gale quickened, and before an hour it blew a perfect hurricane. The tempest was accompanied by a deluge of rain and hail, and at intervals by vivid lightning and by thunder, which made itself heard above the roar of the storm. The gale continued until three o'clock this morning, when the wind somewhat calmed. Though an immense amount of damage has been done to house property throughout the city, chimney stacks and roofs being torn away in the older parts of the town, no casualties or loss of life have been reported."

The force of the gale suddenly lulled when the change of wind and heavy rain and hail occurred, about 11.15 p.m. Having been agreeably surprised by the ceasing of the hurly-burly outside, I looked at my watch, and, having noted the time, soon after fell asleep.—I am, &c.,

JAMES GRAVES.

Inisnag Rectory, Stoneyford, Ireland,
Jan. 22, 1871.

16th. Squalls and hail showers prevalent.—II. *Forest Hill.* Between 11.10 and 11.45 a.m. there was a heavy hailstorm, with S.S.W. wind, 0·22 in. of hail and rain fell in 35 minutes. There was also another hailstorm, ending with sleet and snow from 0.20 to 1.40 p.m., the hailstones being 0·25 inch in diameter.—IV. *Dickleburgh, Diss.* Thunder from 1 to 2 p.m., and strong gale. *Diss.* Gale and thunderstorm

at 1 p.m.; wind S.E. by S.—VI. *Saul Lodge.* Violent gale from S.W., barometer falling suddenly to 28·73.

24th and 25th. Heavy fall of snow at several stations on the East Coast.

26th. V. *Land's End.* Snow 2½ deep in sheltered places, and 9 to 15 in. in drifts; very unusual here.

Observers' Summaries for January.

I. *Northwick House, Harrow.* Prevailing winds N.E.

IV. *Diss, Norfolk.* Temperature low throughout; ground not cleared at the end of the month from snow since Dec. 3rd. Prevailing winds during first half of the month S. and S.E., and very cold; during the latter half, N. and N.E.

V. *Kilworthy Hill, Tavistock.* Heavy fogs throughout the month, frequent W. winds. *Taunton.* Intense cold up to the middle of the month; then rain and gales until about the 20th; then bitter E. winds set in till the end of the month.

IX. *Filey.* Intense frost the greater part of the month.

XI. *Llannerch Park.* A cold, inclement month.

XIV. *Cessnock Park.* Frost every day from 1st to 12th; rain and storm 17th; frost daily (less the 19th) to the 31st.

XV. *Ballachulish.* Early part of the month stormy winds from S. and S.W.; from the 19th to the end a continuance of very severe frost, winds from N. and N.W.

XVI. *Dundee.* Prevailing wind 20 days, W.

XXII. *Ballinasloe.* Temperature uniformly low; rainfall large, and very equally distributed, only two without some rain, eight days on which snow or sleet fell; winds variable, but N. most prevailed; month generally raw, cold, and damp.

XXIII. *Carrickfergus.* Till the 15th the prevailing winds were S.W., and from that date S.E.

FEBRUARY.

5th. VII. *Brampton, Derby.* Gale, with heavy rain and thunderstorm.—XXII. *Ballinasloe.* Westerly gale.

6th. Strong S.W. gale general over England.

7th. XV. *Ballachulish.* Strong breeze from S., with rain and hail.

9th, XI. *Llanfrechfa.* Gale, with rain.—XXII. *Ballinasloe.* Gale at night from N.W. to S.W.

10th. I. *Winchmore Hill.* Heavy gale, commencing in S.S.E., and

changing to N.N.E., with a great decrease in temperature, and a fall of snow; maximum in shade on following day only 29°.—IV. *Diss.* Heavy rain from 7.30 a.m. to noon, then snow and sleet till evening. *West Tofts.* Rain and snow. V. *Holsworthy.* Cold N. wind. *Kilworthy.* Mercury fell 0·54, and strong wind began from S.E.—VII. *Brampton, Derby.* Gale, with hail and snow.—IX. *Askrigg.* Very stormy, with heavy fall of snow.—XIV. *Holehouse.* Stormy, but dry and cold.

11th. VII. *Brampton.* Thunderstorm.—X. *Kirkby Lonsdale.* Gale of 45 miles an hour, with snow.—XXII. *Ballinasloe.* Gale from S.E., with hard frost.

12th. V. *Kilworthy.* Very stormy S. wind.—XI. *Llanfrechfa.* Gale, with rain.—VII. *Mansfield.* Sleet and rain.—XXII. *Markree.* Brilliant aurora.

21st. V. *Dartmoor.* Gale from N.N.W.—XV. *Ballachulish.* Gale, lasting till 22nd.

24th. XV. *Ballachulish.* Gale from S.W.

25th. I. *Winchmore Hill.* Lightning.

26th. V. *Dartmoor.* Gale from S. at night.

27th. IV. *West Tofts, Brandon.* Rain and hail, with thunderstorm between 1 and 1.30 p.m.—VII. *Mansfield.* Windy, with rain.—XI. *Presteign.* Strong gale.—XVIII. *Budgate, Nairn.* Rain and snow at night.

Observers' Summaries for February.

II. *Bromley Common.* Total fall 1·25 below the average of five years.

V. *Kilworthy.* Temperature through the month has been pretty fair in the valleys, but bleak on the hills.

VII. *Mansfield.* Commencing with frost and bright days; a period of rain and cold, wretched weather ensued; the month closed with a very fine fortnight; vegetation is consequently forward, considering the long winter.

XIV. *Cessnock Park.* Prevailing winds after the 5th, S. and S.W.; there was only frost on three nights; min. temp. 27° on the 1st.

XV. *Ballachulish.* Commenced here with severe frosty weather, and on the whole was a very wet, boisterous month.

XVIII. *Strathconan.* Winter frost out of the ground on the 6th, and no further frost till the 28th; the month has been very wet, but a few warm days each week.

XVIII. *Gairloch.* First week winds E.; 2nd, S.W.; 3rd, N.W.; and 4th variable.

XXII. *Ballinasloe.* Several slight auroral displays; very rapid and unusual perturbations of the barometer, especially during the first half of the month; month generally dull and damp; slight rain on nearly every day.

XXII. *Markree.* Temp. very high throughout the month.

XXIII. *Carrickfergus.* Easterly winds till 4th, then southerly, with few exceptions, to the end.

MARCH.

1st. VII. *Brampton.* Lunar halo 90° in diameter.

3rd. Very fine warm day, the warmest of the month at most Scotch and Irish stations.

6th. V. *Druid, Ashburton.* Very strong wind.—XIV. *Holehouse.* Showery and stormy.

8th. V. *Dartmoor.* Snow. *Druid,* hail and rain.—X. *Casterton,* Hail-storm.—XII. *Melrose.* Lightning at 8.30 p.m.—XIV. *Holehouse.* Hail showers.—XVII. *Budgate, Nairn.* Rough snow showers.

9th. IV. *Diss.* Heavy gale from S. in afternoon and night.—V. *Dartmoor.* Hail and rain. *Druid.* Rain from 10 a.m. to 7 p.m. *Kilworthy.* Very stormy, S.W. wind.—VII. *Mansfield.* Very wet day.—XI. *Presteign.* Sudden hard gale.—XIV. *Holehouse.* Snow showers.

11th. XIV. *Holehouse.* Very wet and stormy.—XV. *Ballachulish.* Very heavy rain.

12th. Rough and stormy weather general, with snow at—XVII. *Budgate.*

13th. Hail and snow showers in several detached localities.

14th. IV. *Diss.* Snow and hail from S.W. in forenoon.—V. *Ashburton.* Snow at night. *Kilworthy.* Snow showers from S.W.—VII. *Chesterfield.* Heavy snow during the night, measuring from 6 in. to 1 ft. thick.

15th. Snow in the Eastern and South-Eastern counties of England. IV. *Diss.* Snow from E. in early morning, lying two inches deep, but thawing rapidly.—V. *Holne.* A gale.—XV. *Ballachulish.* Snow, with wind in S.E.

16th. Aurora seen from I. *Winchmore Hill,* and XII. *Melrose.*—IV. *Sudbury.* Snowstorm from E.—V. *Brampton.* Heavy snow-storm.

17th. Two slight shocks of earthquake, principally felt in the

Northern and North-Western counties of England. Having explained the area, and roughly indicated the rate of progression in the *Meteorological Magazine* for April, 1871, it is only now desirable to quote those returns which, by assigning definite times to the sensation throw light upon the accuracy of the views therein enunciated.—VIII. *South Shore.* Earthquake at 11.5 p.m.—IX. *Askrigg.* A slight shock of earthquake at 6.45 p.m.; duration about four seconds; another very violent at 11.15 p.m., duration about six seconds; the weather was very fine at the time; there were several slight shocks felt after the 17th.—*Littlethorpe.* Shock of earthquake distinctly felt at 11 p.m. *Stone House, Dent.* Sharp shock of earthquake at 11.30 p.m.—X. *St. Bees.* Earthquake at 11.20 p.m. *Casterton.* Two shocks of earthquake felt, one at 6.30 p.m., and the other at 11 p.m., the latter much more violent; house shook as if by gunpowder explosion in the neighbourhood; motion from E. to W., but generally from W. to E.; people much alarmed.—XII. *Dumfries, Marchill Cottage.* On the night of 17th, a slight shock of earthquake felt in the district, over a distance of 20 miles in length, by 12 miles in breadth.

21st. V. *Druid Ashburton.* Strong S.W. wind all day.

23rd. Aurora at I. *Winchmore Hill,* and XII. *Dingleton Mains.*

25th. An unusually warm day. There appear to have been several local thunderstorms, as only two of the following notes can have referred to the same storm, viz., the thunder heard in the N. at Bexwell was probably that of the storm at Swaffham; the lightning of this storm (it being *by day*) cannot have been visible at Winchmore Hill; all the other stations are widely separated.—I. *Winchmore Hill.* Lightning.—IV. *Bexwell.* Heavy thunder heard in the distance to the North. *Swaffham.* Very sultry day, and at noon a tempest broke over the town, the thunder at times being very loud, and frequent flashes of lightning were seen, but (though a great quantity of rain fell in some of the neighbouring villages) only a few drops fell here.—VII. *Mansfield.* Distant thunder and lightning. *Sutterton, Spalding.* A sharp thunderstorm has passed over us this afternoon, lasting from about 2.5 to 3 p.m.; vivid lightning and thunder the greater part of the time, almost continuous, but no rain up till now (4 p.m). Wind S.E., backing to E. The temperature has to-day reached the unusual height of 71° in shade; in the sun, by vacuum thermometer, 112°. *Chesterfield.* Very severe thunderstorm between 5.30 and 6.30 p.m.—XII. *Dingleton Mains.* Distant thunder about 4 p.m.

26th. VII. *Mansfield.* A terrific storm of thunder, lightning, and

hail burst over here; hailstones were as large as marbles, and the rain for a short time extremely heavy.

27th. I. *Winchmore Hill.* Heavy thunderstorm at 3 a.m.

Observers' Summaries for March.

IV. *Diss, Norfolk.* From 1st to 13th bright March weather, with much wind from the S. and S.W.; 17th to 25th singularly bright and fine, resembling June weather; cold during the last week.

V. *Kilworthy.* From the 17th to the 22nd inclusive a perfect calm; very fine, with a few cold days throughout the month, after the 17th. *Dart View, Totness.* The month has been very cold; cold east winds have prevailed, especially during the latter part of the month. *Druid, Ashburton.* Easterly winds during last week. *Court Barn, Clawton.* This month has been remarkably favourable for agricultural operations, and the land during the latter part of the month has been well tilled in consequence of the dry state of the ground and the frost in previous months; the soil was so tempered that the wet gradually drained off. The old proverb that when "March comes in like a lion, it goes out like a lamb," has been verified this year.

VII. *Mansfield.* March throughout has been an exceptionally warm and agreeable month, the temp. on some days rising far above the average.

XI. *Llannerch Park.* Very warm from 18th to 27th; very cold, and N.E. wind from 27th to 31st; asparagus cut in the open grounds on 25th; sycamore in leaf, and hedges getting green at the end of the month. *Plas Brereton.* Eleven days of S.S.W. and S.W. winds, frequently increasing to strong gales.

XII. *Dingleton Mains.* Snow on six days.

XV. *Ballachulish.* From the 21st to the end of the month most beautiful weather; more like May than March.

XVII. *Nairn.* Great changes in temp. this month; about 3 p.m., on 13th, the ther. stood at 63°, while at the same hour on the following day (the 14th), it was as low as 32°.

XVIII. *Gairloch.* Westerly winds from 3rd to 19th inclusive; and easterly thence to the 30th.

XVIII. *Strathconan.* Five times as much rain as in March, 1870.

XX. *Glenville, Fermoy.* The latter half of the month quite dry; no rain falling between the 15th and the end.

XXII. *Ballinasloe.* High winds in the beginning of the month; light in the latter part; continued gale from the 5th to 9th, S. and S.E. prevalent; rain on every day to the 15th; no heavy daily fall; latter half of the month dry; total below the average; oscillation of barometer unusually rapid, sudden, and frequent.

XXIII. *Carrickfergus.* Southerly winds from 1st to 23rd; then easterly to end.

APRIL.

1st. VII. *Brampton.* Red aurora.

5th. Throughout the South-Western counties some very fine systems of solar halos were seen about sunset; as, however, they have been fully described and engraved in the *Meteorological Magazine*, further reference is unnecessary.

8th. Sharp frost in Ayrshire.

9th. I. *Winchmore Hill.* Lightning and aurora in evening.—IV. *Hillington.* Aurora brightest between 10 and 11 p.m. *Diss.* Fine aurora.—V. *Court Barn.* Very cold N.E. wind.

12th. I. *Winchmore Hill.* Lightning.

13th. II. *Forest Lodge, Maresfield.* Aurora.—XV. *Ballachulish.* Sharp E. wind in evening.

14th. XI. *Plas Brereton.* Aurora.—XV. *Ballachulish.* Southerly wind and heavy rain.

15th. I. *Winchmore Hill,* and XI. *Plas Brereton.* Aurora.—V. *Court Barn.* High wind from W.

16th. I. *Winchmore Hill.* Aurora.—II. *Beckenham, Fox Grove.* Wind W.S.W.; squally morning, with frequent showers; less wind in afternoon, with frequent heavy showers; heavy rain at night.

17th. I. *Winchmore Hill.* Violent thunderstorm between 1.30 and 2 p.m.—IV. *Diss.* Thunder at 1 p.m. *Dickleburgh.* Stormy, with thunder at 3 p.m.—*Bexwell.* Thunder.—*Hillington.* Thunder.—V. *Court Barn.* Cold, with rain from E.—VII. *Barrowden.* Thunderstorm, with S.W. wind. *Mansfield.* Heavy rain and hail showers.—XIV. *Holehouse.* Cold, stormy, and wet.—XVIII. *Gairloch.* Blowing a gale from E. *Strathconan.* Snow.

18th. II. *Arle Bury, Alresford.* Heavy thunderstorm, with tropical rain, extending only a short distance.—IX. *Ganton Hall.* Stormy and very cold.—XVIII. *Strathconan.* Heavy fall of snow.

19th. I. *Winchmore Hill.* Distant thunder at 6 p.m.—V. *Druid Ashburton.* Hail showers.—*Crewkerne.* Violent hail storms.—IX.

Halifax. Max. temp. of the month.—X. *Casterton.* Violent thunderstorm at 3.35 p.m., with rain and hail, of which 0·40 in. fell in eleven minutes.—XIV. *Holehouse.* Snow on hill-tops.—XV. *Ballachulish.* Strong gale from N.E.—XVII. *Nairn.* Snow and sleet.—XVIII. *Strathconan.* Snow.

20th. Aurora at XI. *Plas Brereton,* and very cold and rough at XVII. *Nairn.*

23rd. Thunder heard at IV. *Hillington,* and (in the distance) at I. *Winchmore Hill.*

25th. *Ballachulish.* Hail shower, with S.E. wind.

27th. I. *Winchmore Hill.* Thunderstorm at 4.20 p.m.—II. *Forest Hill.* A slight thunderstorm occurred about 4.30 p.m., on April 27th. It came up from W.N.W.; the rainfall during its continuance was only ·02 in. Hail, and heavy rain, with much thunder and lightning, are reported to have occurred at Brockley, near New Cross.—*Forest Lodge.* Thunderstorm.—III. *Stoke, Slough.* Thunderstorm between 3.30 and 4 p.m., and again from 4.30 to 5 p.m.; appeared to travel from W. to E.—VII. *Mansfield.* Thunder and heavy rain.—XII. *Dingleton Mains.* Lightning.

28th. IV. *West Tofts.* Heavy rains.—VII. *Mansfield.* Heavy thunderstorm at 11.30.—XII. *Dingleton Mains.* Lightning.

29th. I. *Winchmore Hill.* Violent thunderstorm, with tremendous hail storm—the stones half an inch in diameter; thunder was first heard in N.W. at 3 p.m.; passed nearest about 4, and ceased at 5 p.m. —V. *Lacock, Chippenham.* Severe thunderstorm from 2 to 3.15 p.m. —XII. *Dingleton Mains.* Lightning at 10.30 p.m.

30th. Thunderstorm at II. *Forest Lodge,* and at *Brighton* at 1.45 p.m.

Observers' Summaries for April.

IV. *Hillington.* Dull and cold, beginning of month; milder 10th, and much rain after the 15th.

V. *Kilworthy Hill.* For the first ten days cold bleak winds from N. and E.; from the 11th to the end, mild; S. and W. winds, with heavy rains at intervals.

VII. *Mansfield.* The month has been noted for the extraordinary fall of rain; from the 7th to 13th was fine, the days being hot and sun burning—the nights frosty. On 27th and 28th rain fell, accompanied with thunder; on 28th the thunder was particularly loud, and lightning vivid.

XI. *Plas Brereton.* Grass and other vegetation forward for the season, all crops looking well.

XII. *Dingleton Mains.* A cold wet month, with little sun.

XIV. *Cessnock Park.* We have not had so much rain in April since 1867, when 3·95 in. fell.

XV. *Ballachulish.* The month commenced with dry cold weather, and wind from N.W., but from the 2nd to the 10th the weather was beautiful, though the mornings and evenings were rather chilly.

XVII. *Nairn.* Very cold, with easterly winds during the greater part of the month; on several occasions the ther. stood below freezing point.

XVIII. *Gairloch.* From 5th to 10th inclusive, the weather was mild and beautiful, just like June. *Strathconan.* The fall of snow on the 18th and 19th was so unexpected, that some had their potato fields manured on the morning, and had to leave the manure under snow for a whole week.

XXII. *Ballinasloe.* Wind generally moderate; weather damp; early part up to 9th fine, thence rain nearly every day; bar. very unstable —continued oscillations, generally very rapid; temp. rather low, but equable; rain generally divided, and no great falls; total above the average of the previous six years.

XXIII. *Carrickfergus.* Winds very variable.

MAY.

1st. Fine, clear, and cold, at a few stations frosty.

2nd. XV. *Ballachulish.* Heavy rain.—XXIII. *Carrickfergus.* Thunder and heavy shower.

3rd. V. *Kilworthy.* High wind.—XIV. *Holehouse.* Stormy.—XV. *Ballachulish.* Strong wind from S. and S.E.

8th. I. *Winchmore Hill.* Heavy thunderstorm; thunder first heard in N. at 2.15 p.m.; lightning first seen at 3.15, and from 3.30 to 4.10 was very vivid; the storm passed to S.E. about 4.10 p.m —II. *Bromley Common.* Thunder. *Forest Hill.* Thunderstorm, coming from N.N.W., between 3.45 and 4.30 p.m.; thunder loud, and lightning incessant, and only about a quarter of a mile distant; wind rather strong, and very variable in direction. *Belfield, Croydon.* Thunderstorm between 4.10 and 4.32 p.m., during which 0·52 in. of rain fell. *Richmond.* The thunderstorm which passed over us on the 8th was very interesting in our immediate neighbourhood; a peculiar arch of grey clouds preceded the thunder clouds, and numerous little puffs of clouds continually shot

out from it exactly resembling the bursting of sky rockets in the air as seen by daylight, but perhaps more of a spiral form; possibly these were related to a whirlwind which passed about 1½ miles to the east of us, which was said to have nearly suffocated a lot of men working at the Gas Works, and tore up a tree at a little distance from them; they describe it as having been an immense column of dust, which passed along rapidly. *Brighton.* Thunderstorm in the west.

9th. Cold and windy at most stations.

14th. Cold N.E. winds still prevail.

15th. Thunderstorm at noon at V. *Druid, Ashburton.* Very cold N. wind at XVII. *Budgate.*

16th. VII. *Mansfield.* A very slight fall of snow in the morning. *Barrowden.* Snow and rain.—XIV. *Holehouse.* Frost at night.—XVIII. *Strathconan.* Sharp frost.

17th. V. *Druid.* Aurora at night.—VII. *Brampton.* Snow on the moors.—VIII. *Holker.* Sharp frost; potatoes cut down to the ground; apples and pears so injured as to be a complete failure.—IX. *Stone House, Dent.* Hard frost, with N.E. wind, which destroyed the general fruit crop.—XIV. *Holehouse.* Very cold; temp. 21°; afternoon showery.—XVIII. *Strathconan.* Frost and snow.

21st. XVIII. *Gairloch.* Bitterly cold; snow on the mountains.

22nd. V. *Kilworthy.* Very high wind.

24th. VII. *Mansfield.* An excessively warm and bright day.

25th. I. *Winchmore Hill.* Distant thunder at 2 p.m.—VII. *Mansfield.* Heavy rain all day.—IX. *Ganton Hall.* Thunderstorm.—X. *Casterton.* Heavy rain, 0·68 in. in one-and-a-half-hours.

26th. IX. *Middlesborough.* Thunderstorm, and 0·64 in. of rain in nine hours.—X. *Gainford.* Thunderstorm, during which 0·68 in. of rain fell, and of this 0·50 in. fell in thirty minutes, between 0.12 p.m. and 0.42 p.m.

27th. I. *Winchmore Hill.* Heavy thunderstorm.—II. *Bromley Common.* Thunder. *Forest Hill.* Distant thunder from 2.30 to 2.35 p.m., with rain and N. wind.—IV. *Diss.* Sharp thunderstorm at noon.

Observers' Summaries for May.

I. *Harrow.* A cold dry month; I never recollect the oak and ash out so early in leaf; prevailing winds N.E.

IV. *Diss, Norfolk.* First half of month generally cold and cloudy, the latter half more genial.

V. *Court Barn.* Very hot during the last week, and the ground be-

coming hard. *Dart View, Totness.* Great prevalence of E. winds; very cold nights and mornings; much blight on fruit trees, in consequence of the frost; rainfall very small; country in a sad state for want of rain. *Kilworthy.* The prevailing winds have been from the N. and E.

VII. *Mansfield.* The month has been cold throughout, but little rain has fallen; much fruit has been destroyed by the cold. *Barrowden.* Hoar frost on 12th, 13th, and 14th.

XI. *Plas Brereton.* Sunshine, with N. and N.E. winds have prevailed throughout the month, and the ground has consequently become much parched, and the springs very low so early in the summer. *Heyhope Rectory.* Cold and cloudy, with frequent indications of rain during those days on which no rain actually fell.

XIV. *Holehouse.* Month unusually dry; night temp. low; frost frequent; day temp. rather high; vegetation rather backward; the frost of the 17th did much injury to the potatoes, &c., in the neighbourhood.

XV. *Ballachulish.* Cold dry weather from the 4th to the 16th, more like March than May, the prevailing wind being N.; vegetation three weeks behind former years; wind veered round on evening of 16th to the S.; more genial weather, with occasional showers, on 17th, 18th, and 19th; wind from 17th to 26th continued from the S.; beautiful growing summer weather to the end of the month.

XVIII. *Strathconan.* The month has been very dry throughout. *Gairloch.* The weather has been very mild and genial, with the exception of the 20th and 21st, when the snow was on the mountains, and it was bitterly cold.

XXII. *Ballinasloe.* Weather for the most part fair, though generally dull; some sharp E. and N.E. winds; changes of bar. very gradual and slight; winds mostly light, and northerly most prevalent; last five days very fine; very warm from 6th to 9th, also on 21st and 22nd; cold during the nights.

JUNE

2nd to 5th. Frequent sharp frosts in Herefordshire, Radnor, Merioneth, and other parts of Wales, doing much damage to garden produce.

9th. XI. *Presteign.* So dark at 7 p.m., that candles were required, the sky being covered with a dense black mist.

11th. X. *St. Bees.* Three distinct earthquake shocks at 5.10 p.m.—

XXII. *Markree.* Thunderstorm; the shortest interval between the thunder and lightning (*i.e.* the least time-interval) was 5 seconds.

12th. V. *Court Barn.* Cold easterly wind.

14th. I. *Camden Square.* Lightning in S.S.E. from 10.59 to 11.25 p.m.; one peal of thunder at 11.19 p.m.; lightning in W. at 11.27 and 11.36 p.m.—II. *Forest Hill.* Sheet lightning from 11.17 to 11.27 p.m. in S. and S.W., with distant thunder at 11.26 p.m.; heavy rain for more than an hour. *Maresfield.* Thunderstorm. *Brighton.* Violent thunderstorm, began at 8.45 p.m.; at 9.45 p.m. the rain began to fall in a perfect deluge, and lasted until 10.30, in which period of forty-five minutes 1·20 in. fell. Lightning intense, and flashes occurring every two or three seconds. Total rainfall 1·33 in., being the greatest recorded in twenty-four hours since July 17th, 1850. VII. *Belmont Villas, Leicester.*—Rain began about 11 p.m. on 14th, and continued almost incessantly till 2 p.m. on 15th. At 4.45 p.m. rain re-commenced accompanied by thunder and lightning, very heavy from 5.15 to 5.30 p.m., and from 6 to 6.30. It ceased falling at 7 p.m., and continued fair till 3 a.m. 16th, when a heavy shower fell. The wind during 15th was S.S.W., but changed to N.E. during the thunderstorm in the evening, and then back to S.W. Rain gauge at Belmont Villas, much surrounded with buildings: June 15th, 9 a.m., 1·04; 3 p.m., 0·73; 7 p.m., 1·54; June 16th, 9 a.m., 0·31. Total 3·62. Rain gauge at Freeman's Common, one mile distant, quite exposed: 15th June, 7 p.m., 2·76; 16th June, 9 a.m., 0·23. Total 2·99. *Trent College.*—Rain began during night of 14th, and up to 9 a.m. 15th, 0·80 fell, between 9 a.m. and 4 p.m., a further fall of 0·71, then a thunderstorm between 5 and 7 p.m., yielding 1·27 up to 8 p.m., and subsequently a further fall of 0·30, so that in the twenty-four hours ending 9 a.m. 16th, 2·28 inches fell.

15th. III. *Thorpelands, Northampton.* The rainfall of this day was one of the most extraordinary I remember during several years' observations, the weather being hot and close, and the rain, which nearly all fell between 5 and 6 p.m., a perfect deluge while it lasted, and exactly like a warm shower bath; 1·25 in. fell during the hour.—VII. *Mansfield.* Noteworthy as a day on which the rain fell almost incessantly from morning to night, in a steady fall; heaviest about 11 a.m. *Brampton, Derby.* Heavy rain and thunder. *Swanswick.* Between 8 p.m. of the 14th and 7.30 p.m. of 15th, 2·03 fell, and between 7.35 and 7.47 p.m. an additional fall of 0·55 in. occurred, making 2·58 in. for twenty-hours, between 8 p.m. on 14th and the

same hour on 15th.—IX. *Chapeltown, near Leeds.* ·98 in. in six hours; wind S.E. to E.—X. *Gainford.* 9 a.m. to 3 p.m. ·48 in. fell; the total fall in 24 hours being 1·26.

16th. XXII. *Ballinasloe.* Slight thunder and rain at 3 p.m.

17th. I. *Winchmore Hill.* Thunderstorm commenced at 2.20, with heavy rain; lightning was first seen at 2.30. The lightning was intensely vivid, and very frequent, and the thunder incessant; storm overhead from 2.45 to 3.15. Thunder ceased at 4.10. Amount of rain gauged, ·47 inch. A chimney at the gas works, Ponder's End, was struck by the lightning. III. *Ampthill.* Heavy rain, 1·50 in. fell between 3 and 6 p.m.

18th. VII. *Brampton, Derby.* Thunder and rain.—X. *Scaleby Hall.* ·60 in. fell in three hours in the afternoon. *Casterton, Kirkby Lonsdale.* Remarkable rainbows from 6.30 p.m. to 8.30 p.m.; at 8.15 there were five at one time, three of which seemed blended together; at 8.30 there was a sharp shower here.—XIV. *Cummock.* We had a fall of ·90 in. in 45 minutes, from 6.5 p.m. to 6.50 p.m.

Thunderstorm at North Shields. — Curious Accident. — About one o'clock (Sunday), June 18th, North and South Shields were visited by a severe thunderstorm, accompanied by heavy rains; and while the storm was raging, Mr. Knox, who has charge of the time gun placed on High Hill, at North Shields, was preparing to receive the electric current from the wire to announce one o'clock, and had just inserted two fuses, when there was a vivid flash of lightning, which caused the gun to go off. Mr. Knox was knocked down, and the contents of two vents struck him on the face and head, severely burning him. This is the first instance here of the time gun being discharged by lightning.

19th. I. *Camden Square.* Thunder at 11.50 a.m. and 0.3 p.m.; heavy rain between 2.25 and 2.40 p.m., no less than 0·40 falling in 15 minutes; house reported to be struck by lightning in Knightsbridge. *Winchmore Hill.* Heavy thunderstorm, with vivid lightning at 0·15 p.m. Slight rainfall; storm ceased at 0.50 p.m. 1.30 p.m., heavy and incessant thunder in S.W. 2 p.m., violent thunderstorm. Lightning very vivid, and almost incessant. Storm right overhead from 2.30 to 3 p.m. Tremendous fall of rain for about five minutes at 2.50. Thunder ceased at 3.45 p.m.

II. *Forest Hill.* Distant thunder at 2.10, 3.15, 3.30, and 4.17.—V. *Bincombe House, Crewkerne.* Heavy thunderstorm; 1·20 in. of rain fell in a few hours.—VII. *Brampton, Derby.* Thunder and rain.

Thunderstorm at Leicester. — A succession of thunderstorms passed over Leicestershire, June 19th, from the south-west. The lightning was very vivid, and the thunder exceedingly loud, while rain fell in torrents, placing the low-

lying districts under water. At Leicester, and in the southern parts of the county, the storm was accompanied by an exceedingly heavy downfall of large hailstones. Shortly after five o'clock a vivid flash (which was immediately followed by a loud crash of thunder) struck a stack of chimneys in a solitary row of houses in the south-eastern part of Leicester, and the pile was shivered into atoms. The electric current descended the chimney of one of the houses into a room where a number of persons were at tea, forced the mantelpiece from its position, and scattered the ornaments thereon about the room. The same flash struck a woman while washing in the schools connected with the workhouse, which is situated in the same locality, and completely paralysed her right side. She remained insensible for some time.

Fall of a "Thunderbolt" in Derby.—The inhabitants of St. John-street, were startled on the morning of June 19, by a loud report caused by the fall of a ball of "electric fire." Between 8 and 9 o'clock a fearful flash of lightning swept over the district surrounding John-street, and caused no small consternation. Mr. Roe, stonemason, 50, John-street, was sitting at breakfast with his wife, when they were startled by a loud report, appearing to proceed from the roof of the house. Rushing into the street, they perceived that two chimney-pots had been moved from their foundation, and two large apertures made in the roof by a ball of fire, which, according to the testimony of an eye-witness, exploded, and emitted a lurid glare. The wife of Mr. Rawson, plumber and glazier, residing next door, states that she was in bed, and was startled by a loud report and brilliant illumination, which lit up the whole house. Greatly terrified, she rushed down stairs, but found that no great damage had been done. A woman, living adjacent, describes the phenomenon as a "ball of fire, surrounded by blue light."

Great Thunderstorm at Chester.—A very severe thunderstorm occurred at Chester, on the 19th of June, doing considerable damage. Three houses were struck by the electric fluid, but fortunately no one was seriously injured, although the escape of one man is most marvellous. The proprietor of a small eating-house in Northgate-street, James Bell, was sitting by the fire, when there was a fall of soot, and immediately his clothes on the right side took fire. His wife, with great presence of mind, jumped up and covered him with her linsey dress, and so put out the flames, which had singed one whisker off and blistered his ear. The front door was open, and Mrs. Bell describes the "thunderbolt" as being blue and white, and going out at the front door. The lightning was also seen to strike a house in Boughton. The chimneys of the houses occupied by Mrs. Oakes and Mrs. Roscoe were set on fire, and the services of the volunteer fire brigade were needed. The electric fluid had taken a curiously-erratic course in Mrs. Oakes's house. It had passed along the bell wires, scorching the walls and woodwork, and smashing the lamp glasses and the windows. At another house, Mr. Kelsall's, in Princess-street, it had been conducted over the house by the gas-piping, a piece of which was torn away in the front bedroom. A bandbox was split into small fragments, a leather satchel had been scorched, and the chain wrenched from it, and the windows broken. In each instance circular holes were made in one or two panes, and at Messrs. Thomas and Blayney's an oval piece of glass was cut out of a skylight.

20th. I. *Camden Square.* Thunder first heard at 1.6 p.m., and

almost incessant until 2.57 p.m.; vivid lightning, especially in S.W. and W.S.W. from 1.37 to 2.55, distance varying from one to six miles. A little hail, about 0·15 in. diameter, at 2.28 p.m.—II. *Forest Hill.* A thunderstorm passed to the N. of us in a W.N.W. current, from 1.45 to 2.15; I saw zig-zag lightning about four miles distant to the N.E. from 2.0 to 2.15; I saw an up-stroke at 2.7; after two heavy cumulo-strati passed overhead, and rain began to fall, and continued to 2.27; from 2.18 to 2.24 very large hail, so abundant as to nearly whiten the ground; the hailstones were 0·6 in. in diameter, mostly conical and amorphous; vivid lightning and loud thunder at 2.22, a quarter of a mile distant, and at 2.24; thunder and lightning again commenced at 2.40, and lasted till 3.30. *Forest Lodge.* Thunderstorm.—IV. *Diss, Norfolk.* Thunderstorm of unusual violence and duration, 11.45 to 3.45, within a distance of six miles; much injury was caused by this storm to trees and buildings, a barn was burnt; and at *Dickleborough*, where the storm lasted from noon till 4 p.m., ten lambs were killed. *Bexwell.* Thunder.—VII. *Brampton, Derby.* Thunderstorm and rain.

21st. II. *Forest Lodge.* Thunderstorm.

23rd. VI. *Hagley Rectory.* Ther. stood at 46° at 3 p.m.

23rd to 25th. XX. *Bruce Villa, Clonmel.* Very cold, ther. at 39°.

Observers' Summaries for June.

IV. *Diss, Norfolk.* First twelve days extraordinarily cold for the season; fires general in sitting-rooms; 13th to 20th warmer, with much cloud; thunderstorm on 20th of unusual violence, after which the weather again became cold and cloudy, with N. or N.W. winds, and increased pressure till the 25th, when the mercury began to fall. The crops look remarkably well, and grass is generally abundant, but hay-making slow; fires in sitting-rooms since 20th; summer weather at the end.

V. *Kilworthy Hill.* Cloudy and overcast nearly all the month through, but ten days on which rain was measured, five of them being from 18th to 22nd inclusive, the wind being W. or S.W. all the time. *Court Barn.* Warm from 16th to 20th inclusive.

VII. *Mansfield.* The month here has been free from heat; the days generally dull and sunless; from 13th rain fell more or less nearly every day, sometimes in slight showers, sometimes in heavy falls; very little thunder has been heard, and few of these downfalls can be attributable to the electric fluid.

XI. *Llannerch Park.* A cold unseasonable month; plenty of grass; crops of all sorts promise well. *Plas Brereton.* The rivers and springs are very low, the small rainfall being rapidly absorbed by the parched earth, and leaving no trace in an hour after its descent; easterly winds prevailed from the 1st to the 23rd; afterwards S.W.

XV. *Ballachulish.* A remarkably dry month here till within a few days of the end; wind generally, till the 27th, from N. or N.E.

XVII. *Nairn.* Easterly winds prevailed till near the end of the month.

XVIII. *Strathconan.* The month has been dry and cold during one half of it at least; some frosty nights did considerable injury to the potato crop; water mixed with sulphur in large quantities on 3rd and on 11th, when there was thunder, and the sulphur was quite visible. *Gairloch.* Very mild and warm; from 23rd to 26th the heat was very great; prevailing wind was S.S.W., and only once, and that but for 12 hours, easterly.

XXII. *Ballinasloe.* Temp. rather low, but equable; early part of month fine; latter half showery, and rainfall greatly in excess of average for the three previous years; prevailing winds easterly in early part of the month; and S.W. and N.W. in the latter part, for the most part light.

XXIII. *Carrickfergus.* Great prevalence of easterly wind.

JULY.

3rd. XXI. *Fitzwilliam Square, Dublin.* 0·184 in. of rain in 20 minutes.—XXIII. *Carrickfergus.* Thunderstorm from 2.32 to 3.25 p.m., with rain.

4th. *Otterbourne, Winchester.*—On the 4th, we were touched by an unusually close thunderstorm, about 4.30 p.m.; it travelled nearly from west to east, and in 3½ miles struck six trees, by no means large or prominent ones, the last being in my garden. I was in an out-house, about 50 feet distant, at the time; the clap of thunder was one single report, and the concussion exactly similar to that experienced when near a heavy gun fired.—III. *Kingham.* Thunderstorm, and 1·00 in. of rain.—XVIII. *Beaufort Castle.* Thunderstorm at noon, with hail, but only lasting a short time.—XXIII. *Carrickfergus.* Thunderstorm at 1.30 p.m.

5th. XXII. *Markree.* Solar halo, 45° diameter at 8 p.m.

Buckingham.—On the afternoon of the 5th of July, a fearful storm passed over the lower part of the county of Buckingham, taking a south-easterly direc-

tion from Cosgrove to Wavendon. In its course the lightning killed a poor fellow who was walking on the road with two of his children.

Essex.—On the afternoon of the 5th of July, while a severe storm of thunder, lightning, and rain, was passing over Stratford, in Essex, the lightning seriously injured the Castle tavern, a large and lofty building in Low Leyton-road, Stratford. The electric fluid struck a stack of chimneys and shattered them. The lightning descended the chimney into the club-room, and splintered a large and heavy marble mantelshelf, and dividing, found its way into the bed-room, and dislodged the bricks of one side of the room. The other current forced its way down the chimney into the parlour, and a large stove was removed from its place.

Cromer.—On the evening of July 5th, a heavy thunderstorm passed over Cromer, Norfolk, and the parish church was struck by lightning. The south-west pinnacle of the tower was cut in two, and although it was still left standing it has been considered prudent to pull it down. The clock was also injured, but the rest of the church escaped unhurt.

King's Lynn.—During a heavy thunderstorm, which visited King's Lynn on the evening of the 4th [? 5th, ED.] of July, and which lasted only about a quarter of an hour, the lightning struck the south-west turret of the south-west tower of the fine old church of St. Margaret's, by which the turret was shattered into fragments. Some of these were hurled a distance of 100 yards. In another part of the town, remote from the church, the centre house of a row of buildings in Exton's-road was also struck by the lightning, by which the chimneys were smashed, and the electric fluid, after passing through the top window of a back room, ran along an iron gutter, the spouting of which it entered, and which exploded at its base near the ground, knocking down one of the inmates of a room below. In the neighbourhood of the town a young horse was killed by lightning, at the South Wootton Marsh, the property of Mr. W. F. Baker, of Tilney. On the other side of the river Ouze a horse belonging to Mr. Walter Betts, the well-known cattle dealer, was killed. Some trees were also struck in the Chase fields, under which some labourers sought shelter from the rain, but they escaped without injury.

Glasgow.—On the afternoon of the 5th of July, a very heavy shower of rain fell at Glasgow, betokening a thunderstorm in the vicinity. The weather otherwise was mild and agreeable. A Greenock correspondent states that between twelve and one o'clock on the 5th, a storm of lightning and thunder, accompanied by heavy rain and hailstones, passed along from north to east along the north shore on the lower portion of the river. In Helensburgh hailstones fell during the storm. In Greenock there was bright sunshine, being a strong contrast to the darkness which prevailed on the other side of the river. No damage was done. An Airdrie correspondent writes that for several hours the flashes of lightning and the rolling of the thunder were incessant, while rain and hail fell at intervals in torrents. In the afternoon an old man named James Arthur, was killed.

8th. VII. *Mansfield.* Heavy thunderstorm.—XXI. *Fitzwilliam Square.* Thunderstorm.—XXII. *Ballinasloe.* Thunder; 0·30 in. fell in eight minutes, between 9 and 10 a.m., with hail.—XXIII. *Carrickfergus.* Thunderstorm at noon, with very heavy rain and hail.

9th. V. *Chalbury.* Rain fell rapidly here, yet within half-a-mile on the N. of us, and a mile on the S.E. of us, not a drop fell. Here it

ran off the house in sheets for a minute or two; as soon as its excessive violence abated I went to the gauge and measured it, 0·18 for the five minutes from 10h. 4m. to 10h. 9m., a.m.—IX. *Middlesborough.* 0·20 in. of rain in 20 minutes.—XXIII. *Carrickfergus.* Thunderstorm at 3 p.m.

10th. I. *Winchmore Hill.* Rain commenced at 10 p.m. on 10th, and continued till 4 p.m., 11th. The amount to 9 a.m., was 1·03 inch, and ·41 inch fell between that time and 4 p.m., making 1·44 inch in the twenty-four hours. *Northwick House, Harrow.* The rainfall of the last twenty-four hours, which has just ceased (4 p.m., 11th), amounts to 1·32. From 3 to 9 a.m., it fell at the rate of 0·12 in. an hour.—II. *Cobham.* Rainfall, July 10th, 0·75 in., July 11th, 0·45. Total, 1·20. All fell between 4 p.m. on 10th and 4 p.m. of the 11th, say in twenty-four hours. *Heathfield Lodge, Chislehurst.* The rainfall here was to 9 a.m., July 11th, 1·16 in., thence to 9 p.m., ·25, making a total of 1·41. *Eltham Green.* Rain began on the afternoon of 10th, and I measured ·85 inch of rain to 9 a.m., 11th; and ·50 fell after 9 a.m., making 1·35 inches in twenty-four hours. *Lymington.* Heavy rain; 1·51 in. fell in 21 hours. *Woolston Lodge, near Southampton.* It commenced raining about 4 p.m., on the 10th, with a light S.S.E. wind, varying to E. and S.E. in the evening, finally shifting into the N. after dark. Temperature, early p.m., stood at 70°; at 7, evening, at 53°·5. The rain increased to a steady downpour as the night drew in, and continued without intermission till about noon on the 11th, wind blowing from the N. during night, and morning quite winterly. I measured off 1·72 inch at 9 a.m. on 11th, and in the evening ·33, making altogether 2·05 inches, for, say hardly twenty hours' rain. *Shirely Warren, Southampton.* Rain between 4 p.m. July 10th, and 4 p.m. July 11th, = 2·00 inch. Wind on 10th, S.E., on 11th, N.W. *Otterbourne, Winchester.* Rain commenced at 5 p.m., July 10th. Next morning, at 9 a.m., my gauge contained 2·38 inches of rain; it continued till 1 p.m., and my next reading was ·27; thus the rainfall was 2·65 inches in twenty hours. In seven years the largest fall I have recorded was 1·60 in December, 1865. At Hursley, three miles distant, the reading on the morning of the 11th, at 9 a.m., was 1·98. *Bishops Waltham.* Between 9 a.m., 10th, and 9 a.m., 11th, 2·23 inches fell. *Bishop's Sutton, Alresford.* Rain began at 3.30 p.m., and 2·40 fell before 10 a.m. on 11th, and 0·25 more before 3, making 2·65 in twenty four hours. *Englefield, Reading.* The rainfall in the night of the 10th inst. was the heaviest ever registered by me at this place, and amounted to 1·46 inches; the greater part of which fell

between 10 p.m. on 10th and 9 a.m. on the 11th. *Wantage.* The rainfall between 4 p.m. on 10th, and noon on 11th, is the heaviest in my experience. It amounted to 1·76, of which 1·65 fell up to 9 a.m., and 0·11 between 9 and noon.—III. *Ampthill.* We had a heavy fall of rain on the night of 10th; 1·47 fell between 6 p.m. and 9 a.m., on 11th, and 0·21 up to 11 a.m., when rain ceased, making total of 1·68. *Merton Villa, Cambridge.* (10th.) Occasional light rain from 6.30 p.m., till 10·0 p.m., .01; heavy, incessant, from 10.0 p.m. (10th), to 9 a.m. (11th), = ·61. Heavy showers, light rain in intervals, from 9.0 a.m. to 2.0 p.m., = ·12. Total ·74.—V. *Chalbury.* At about 2.20 p.m., on the 10th, it began to drizzle here, but soon settled down into a steady rain, which continued till noon on 11th. At 10 a.m., on 11th, I found 1·61 inch in my gauge.—XXIII. *Carrickfergus.* Thunderstorm and rain at 2 p.m.

14th. IX. *Otterburn.* Heavy rain between 1.15 and 3.15 p.m in. which two hours 1·23 in. fell; the effect of this sudden fall was seen at 4 p.m., in one of the largest floods in the Otterburn ever remembered; the district is grass, but very well drained. [This is a striking illustration of the effects of drainage in such districts; in less than three hours from the commencement, and less than one hour after the close of the heavy rain, the bulk of it is rushing down the rivers in its course to the ocean. At Otterburn, with a mean rainfall of probably some 40 or 50 inches, the loss of this water is not perhaps to be regretted, considered simply as water, but look at it as motive power; the height is about 500 feet above the sea, the valley contains perhaps nine square miles; the fall at the site of the rain gauge was probably less than on the hills, but let us take the amount recorded, and further allow 0·24 in. for percolation, which leaves 0·99 in. to run off, or exactly 100 tons per acre; then, as there are 640 acres in a mile, the nine miles will discharge into the Otterburn, 576,000 tons of water, at a minimum altitude of 500 feet. The Otterburn is one of the feeders of the river Aire, and this water would have to traverse its somewhat devious course, in order to reach the sea; but its entire distance, measured along its banks, does not seem much more than 75 miles. However, in order to keep our result as low as possible, we will assume it to be 100 miles. Many rivers run with a less slope or fall than 1 foot per mile, therefore, the whole of this water would run off, if its source at Otterburn were 100 feet instead of 500 feet above the sea, and hence we have the spare mechanical force of 576,000 tons, falling 400 feet, or 516,096,000,000 foot pounds (*i.e.*, pounds falling one foot).

It is true that part of this treasure of force is utilized by the mills on the river, and by that ably-managed body, the Aire and Calder Navigation Company; but even under these favourable circumstances, we do not suppose that one-fourth of its mechanical equivalent is turned to useful account. There is no doubt that in this country we are prodigally wasteful of many of our resources, and that we might with wisdom and profit follow the example set by our Transatlantic brethren, in such works as Wells' "*Water Power of Maine.*"]—Ed.

19th. VII. *Branston Hall, Lincoln.* The rain caught this day, ·05 in. in a drizzling shower, was red or sherry coloured; I have it yet.

22nd. XVIII. *Strathconan.* Thunder. 0·53 of rain fell in one hour.—XXIII. *Carrickfergus.* Thunderstorm and heavy rain at noon.

23rd. VII. *Mansfield.* Heavy thunder.

24th. IV. *Diss.* Heavy thunderstorm to S.W.; a barn set on fire at Botesdale, seven miles from Diss. XIX. *Pulteney House, Wick.* 0·64 in. of rain fell in two hours.

25th. II. *Lymington.* Heavy rain between 9.30 and 9.50 a.m., 0·20 in. falling in 20 minutes.—XXIII. *Carrickfergus.* Intense shower of rain and hail at 2.30 p.m.

29th. II. *Lymington.* Frequent lightning in the evening.—V. *Lacock, Chippenham.* Severe thunderstorm from 5 to 6.15 p.m.; distant thunder and lightning at midnight; 0·16 in. of rain fell in eight minutes. *Navigation School, Plymouth.* More than three-quarters of an inch fell in less than half-an-hour, being the heaviest shower I ever witnessed; the whole of the lower part of the town was flooded. *Dartmoor.* Thunderstorm. *Druid, Ashburton.* Thunderstorm in afternoon. *Bath* A sharp thunderstorm came up from S.W. about 5.15 p.m., and lasted 35 minutes, during which time 0·44 inch of rain and hail fell; the lightning was very frequent, and some of the flashes were followed by crashing peals of thunder at one and two seconds interval. A horse towing a barge along the Avon was struck dead; the man who was leading him by the bridle escaped unhurt.—VIII. *Lancaster.* Thunderstorm in afternoon, with a total rainfall of 1·31 inches, of which 1·00 fell between 2 and 4 p.m.—XXI. *Dublin, Fitzwilliam Square.* Very severe thunder and hailstorm at 3 p.m.—XXII. *Ballinasloe.* Thunderstorm at 3 p.m.

30th. V. *Lacock, Chippenham.* Heavy gale from 6 to 9 a.m.; distant thunder frequent during the day.

Observers' Summaries for July.

IV. *Diss, Norfolk.* Haymaking much delayed by wet, but on the whole it is a large crop, and much of it well secured; harvest will be late, but the cereals and root crops look well and abundant.

V. *Lacock, Chippenham.* A remarkably cold July; the ther. in shade rarely rising above 70°; greatest min. temp. 62° on 16th. *Kilworthy Hill.* Very light winds, frequent heavy showers from S. and S.W.; the temp. much below the average. *Court Barn, Clawton.* Notwithstanding the quantity of rain, the rivulets have hardly had running water, and the earth in gardens and fields has dried so fast as to require the quantity of rain which has fallen to keep the earth sufficiently moist to grow the crops. *Taunton.* The number of days on which rain has fallen has made it very disastrous for haymaking, and has, I fear, been injurious to the kerning of the wheat; the potato disease is showing itself, and if we have not fine dry weather, will seriously injure the crop.

IX. *Buckden.* A very wet month.

XI. *Heyhope.* Very cold and ungenial. *Llannerch.* Weather showery and broken, but no floods or heavy continuous rains; generally cold for the season; hay harvest not finished. *Plas Brereton.* Wind S. to S.W. by W. 26 days in the month.

XV. *Ballachulish.* Fine at the beginning, but generally wet and cold from the 5th to the end.

XVII. *Nairn.* Warm, with a good deal of thunder.

XVIII. *Strathconan.* Owing to the rain the hay-crop in this locality is in a rather unfavourable state; where it has been cut early, it has been almost impossible to season it, as there have not been two dry days in succession; the greater part has either been left late or is uncut; other crops are in excellent condition; frosty nights sometimes occur between the heavy falls of rain.

XXII. *Ballinasloe.* Bar. fluctuating and unsettled, but without any violent oscillations; temp. generally low for the season; weather very wet and unsettled; rainfall greatly in excess of average; winds moderate and variable, but W. the most prevalent.

XXIII. *Carrickfergus.*—Winds S., or compounds of S. on 27 days.

AUGUST.

8th. XIV. *Meadow Bank.* The heaviest rainfall of the year during a thunderstorm, more than 2 in. having fallen.

12th. Very hot; temp. in shade reached 80° at almost all English stations, and exceeded 90° at several.

13th. Another very hot day; temp. nearly 90°, with severe thunderstorm in the afternoon and evening, as will be seen from the following reports:—II. *Ashbury Vicarage.* The thunderstorm of this day was one of the most remarkable ever known here; at half-past 6 in the evening, during Divine service, the sky became perfectly dark, so that it was impossible to read; the rain fell in torrents like a waterspout; the amount, which is the largest I have ever recorded in one day, 1·89 in., all fell between 5.30 and 7.30 p.m.—V. *Chippenham, Lacock.* At 2.30 p.m., distant thunder commenced; from 4.45 till 5 p.m., lightning flashing from several quarters at the same time; thunder incessant from 4.45 till 6, a portion of the storm hanging directly over this district; very violent until 6.30, when it commenced to gradually sink away in the W., lightning being very vivid until midnight in N.W. . The wind blew in violent gusts alternately from S.W. and N.E. 0·60 inch of rain fell in a quarter-of-an-hour, in violent showers, between 5 and 5.30 p.m. Thunderstorm also at *Ham, Ashburton, Clawton,* and *Dartmoor. Sunnyside, Trowbridge.* Thunderstorm between 4.30 and 5.30 p.m.; fall of rain, 1·53. *Bincombe House, Crewkerne.* Thunderstorm with heavy rain. *Weston, Somerset.* 2.45 p.m. began to thunder; 3.45 to rain; the rain continued to 7 p.m., and the thunder and lightning till 10 p.m.; the lightning was so frequent and the thunder so continuous, that there did not appear to be the least interval between the peals. *Martock, Yeovil.* The maximum temperature in the shade on the 13th rose to 84°·9, the morning being calm, and electrical clouds coming up from S.S.E. The wind at noon was N.E.; a little rain, with thunder and lightning occurred at 11.40 a.m. At 1.30 p.m., heavy clouds appeared, and distant thunder was heard in the S.E.; the storm slowly advanced, and heavy rain began to fall at 2 p.m. and lasted till 2.15, from which time it rained till 3.30 p.m., but only slightly after 3 p.m. Very heavy hail and rain fell from 2.2 to 2.7 p.m., the hailstones averaging half-inch in diameter, and leaving the ground white for some time after they had ceased falling. The lightning and thunder were very frequent from 1.50 to 3.15 p.m., and continued in the N. till 3.45 p.m. The lightning was mostly from one mile to half-a-mile distant. The wind blew a sudden squall from S.S.E. at 2, was calm from 2.15 to 4 and then blew from N.N.E. The rain that fell into a suitable receptacle, with straight sides, measured 1·2 in. at 3.30 p.m.—VI. *The Graig, Ashfield, Ross.* Thunderstorm; rain during this storm, which began on 12th, 1·50. *Sambourn, Warwick.* Fearful

thunderstorm; rain commenced 8.50 p.m., lasted till 10 p.m.; rainfall in one hour and 10 minutes, 1·81. *Studley, Redditch.* The rainfall during the storm is much in excess of anything I have recorded; it amounted to 2·55 in. between 8.50 and 11 p.m., or two hours and ten minutes. Mr. Winkfield records 1·81 in. from 8.50 to 10.10 p.m., or one hour and twenty minutes. I estimate my height at 350 ft. Mr. Winkfield is situated about a mile west, and at least 100 ft. higher. The fall does not appear to have been quite so great or lasted so long with him as it did here, but seems to have been more confined to the valleys of the Avon and the Alne from Evesham to this place. At Henley-in-Arden, six miles east, and more elevated, there was, I am told, comparatively little rain, though I can give no quantity;—I see you have a correspondent there. The lightning was very vivid and continuous, commencing between 7 and 8 in the S.E., and passing to the N.W.; the last flash I saw was between 2 and 3 a.m. on 14th. No hail fell here, but there was some a few miles south.—VII. *Mansfield.* Max. of month 90°; dull afternoon; thunder in the distance. —XI. *Presteign.* In the evening the lightning was worse than I had ever seen it out of the tropics; little thunder and rain.—XXIII. *Carrickfergus.* Lightning.

14th. V. *Chippenham.* Thunderstorm in S.W. at 3 p.m. *Melbury, Dorset.* A remarkable thunderstorm; thunder first heard to the E. about 4 p.m., and at some distance, but it was soon close upon us, and after some heavy peals the rain came down heavily; shortly after 5 p.m. the storm abated, going off in a northerly direction, but soon returned, and all round, from 5.30 to 8 p.m. we had a continuous storm, some of the peals of thunder being exceedingly loud, with much lightning and torrents of rain; in the four hours the storm lasted, our gauge received 4·24 in., the largest quantity ever known to have fallen in this neighbourhood in such a short time; of course much damage was done, the roads and walks in many places were washed out to their foundations, as where, from local causes, a rush of water took place, the drains were found quite insufficient, ponds overflowed their banks, low grounds flooded, lower down the park a house had three feet of water on the ground floor; still lower, at Melbury village, two aged women were rescued with difficulty, the flood passing in and out at their cottage windows, so rapid was the rise of the flood that there was no time for precaution; providentially no lives were lost, but a miller lower down lost heavily, his mill being flooded, &c. &c. A violent storm is reported from most of the

Devonshire stations, but no details are given. *Bincombe House, Crewkerne.* About 8 a.m. a few light clouds were flying about; wind N.E.; barometer steady; at 11 heavy clouds rising up from the S. and S.S.W., but they passed off again, and it became almost cloudless till 1.30, when the clouds began to increase very fast as they were moving on the lower current, which was N.E., and the higher S.S.E.; thermometer was 81° at 2.30, and the barometer rather falling; at 3·30, as I was watching some work which our men were doing in a valley, I heard thunder, and went up to the top of the hill just above; the far hills in the south, which had been very misty all the day, had become very clear, and there was a heavy line of cloud to the south, just above the hills, extending from E.S.E. to W., and just over head, with forked lightning, and thunder every two or three minutes. About four o'clock, when the sky was nearly overcast, the wind, which was rather high, became dead calm, and veered to the W.S.W., the thunder and lightning increasing very fast; suddenly the wind got up back to the E. again, and blew a gale, with tremendous rain and hail for half an hour, when it stopped, and became very calm again; I measured 0·60 of rain; it cleared in the south, but the thunder and lightning rather increased in the N.N.E.; at 5.45, it again clouded in, and soon after 6 the wind got up and the rain and hail came down in sheets of water. I happened to be in the town when the second storm came on; the roads, which are very wide, were in a few minutes so high that it would have been dangerous to have crossed over; nearly every house in the town was flooded, which was never known before; the lightning was very vivid, and the thunder like great cannons going off; in many places here the roads were washed away; there was very little damage done to the corn, a good deal being cut; as soon as it stopped, which was at 7, I measured and found 1·68 in., more than 1 in. having fallen in about three-quarters of an hour. My cousin, who is about a quarter of a mile to the east of me, measured 1·80 in. in the two storms, which is 0·12 more than I had; thermometer went down from 81° to 62°. *Martock, Yeovil.* Heavy thunderstorms, with rain, occurred from 4 to 5, 5.45 to 6.15, and 6.30 to 8 p.m., coming from E.S.E.; very heavy rain fell from 6.45 to 7.15 p.m., accompanied by very vivid pink lightning, at times forked, and only one-eighth of a mile distant, and tremendous thunder. The lightning and thunder were almost incessant from 6.15 to 7.30. Bullocks and sheep were killed by the lightning in several places within a radius of 10 miles, the nearest casualty being three sheep killed about half-a-mile off to the N.E. The

water from the land floods in the main street of Martock was two feet deep in several places. The house I was living in was partially flooded both on the 13th and 14th. It had never been so before within living memory, since, being on higher ground, it is not subject to the floods which sometimes occur on the lower parts of the district. The rainfall on the 14th I calculated was about one inch; the wind was E. in the morning, then E.S.E., and changed to S.E. at 7 p.m.—E. E. GLYDE.

15th. V. *Chippenham.* Thunder in S.E. at night. *Court Barn.* Thunder without rain.

16th. V. *Chippenham.* Thunder in S.E. during afternoon, lightning at night. *Jacobstowe.* 1·26 in. of rain fell in little more than one hour, during a heavy thunderstorm. *South Molton.* Of the 1·43 in. of rain which fell on this day, 1·41 in. fell in 65 minutes. *Mansfield,* Thunder.

17th. V. *Chippenham.* Lightning at 10.15 p.m. *Ham.* ·90 in. fell in two hours; there had been thunder and lightning on three previous days. *Kilworthy.* Bar. very low; thunder and lightning. *Druid, Ashburton.* Heavy rain in afternoon.—VII. *Branston Hall.* ·50 in. fell in half-an-hour; ·95 in. at Long Hills. *Mansfield.* Thunder and heavy rain. *Holker.* Thunder, very heavy rain, hail, snow, &c.

18th. IV. *Diss.* Sharp thunderstorm between 2 and 3 p.m., during which ·33 in. of rain fell in 12 minutes.—V. *Druid, Ashburton.* Heavy rain to 1 p.m.—IX. *Ganton Hall.* Thunderstorm. X. *Underfell, Kendal.* A heavy thunderstorm from S.W. at 3 p.m.; 3·05 in. fell in three hours. *Burton, Westmoreland.* During the thunderstorm, 1·45 in. fell in 45 minutes, between 2.30 and 3.15 p.m.—XIV. *Auchinraith.* 3 p.m., a very heavy fall of rain, but confined to a small circle of a few miles; my gauge indicated 1·20 in. from 11 a.m. to 5 p.m. *Bothwell Castle.* Total fall 2·81 in., 2 in. of which fell in little over an hour; our drains could not contain the water, and in one case where the main drain passed through an arch in a strong stone wall, the water it could not contain accumulated to such a depth behind the wall, that it burst away 40 feet of it, and did us much damage.

19th. VII. *Brampton.* Thunderstorm.

20th. XIV. *Holehouse.* Extremely wet, especially towards night; great floods; total rain, 2·10 in.—XXIII. *Aghalee.* Between 8 a.m. and 4.30 p.m., 1·35 fell, and during the evening 0·15. *Carrickfergus.* Terrific thunderstorm, with very heavy rain, commenced at 4.45, and terminated at 5 p.m. : rain had been falling all day.

23rd. XVIII. *Strathconan.* A terrific gale, which shook much corn, both green and ripe.—XXII. *Ballinasloe.* Dull, close and stormy, wind S.W.

24th. V. *Chippenham.* Heavy gale from S.—XXII. *Ballinasloe.* Squally gale from S.W.

26th. X. *Casterton, Kirkby Lonsdale.* Heavy thunder and rain; ·47 in. fell in seven or eight minutes.—XXIII. *Moneydig, Garvagh.* Very high wind, injuring ripe, uncut grain.

29th. Thunder at *Ballinasloe.*

Observers' Summaries for August.

II. *Riverhead Vicarage.* The total fall of rain during the month was 2·50 in., of which 2·15 in. fell on the 17th and 18th.

IV. *Diss, Norfolk.* During the first fortnight the heat was great, ther. in shade showing 83° to 85°, and the crops, which had hitherto been backward, owing to wet and cold, ripened rapidly, both roots and cereals looking well. On the 8th the harvest commenced near here, and by the end of the month was near its completion; it can hardly be said to have been *general* till the 13th. The heavy rains of the 17th and 18th were unaccompanied by wind, and were productive of actual benefit to the operations in the field, swelling the grain, refreshing the root crops, and tempering the excessive heat of the air for harvest-work. They probably did great service in removing mildew, which had attacked certain fields, both of wheat and barley; on the whole, as far as I can judge, the harvest here will prove a magnificent one.

V. *Kilworthy.* Early part of month fine; from 13th to 21st very stormy, with dark clouds; latter part of month fine.

VII. *Mansfield.* Remarkable for its extreme dryness, and the very high temp. of the 13th and the days preceding and following it; heavy dews have been frequent throughout the month, but the nights (with perhaps the exception of the 21st) have not been cold; meteors were common on 12th and 13th, and a remarkably fine one was observed on the 11th. Altogether the month has been a very fine one, and very seasonable.

XI. *Llannerch Park.* A fine warm month, corn nearly all cut by the 31st. *Plas Brereton.* With the exception of a severe S.W. storm on the 25th, and a moderate gale to N.W. on 26th, the weather has been chiefly hot and bright.

XV. *Ballachulish.* Generally cold, rough weather throughout the month.

XXII. *Ballinasloe.* Equable and average temp.; gale from N.W. to S.W. on 24th, accompanied by rapid and sudden changes of bar.

SEPTEMBER.

3rd. I. *Northwick House.* Temp. 75° at 11 a.m., and fell to 62°.—IV. *Diss.* Heavy shower, and thunderstorm at 11 a.m.

6th. II. *Forest Hill.* Sheet lightning 8.45 to 9.15 p.m., in N.E.—IV. *Diss.* Heavy thunderstorm from S.E. at 8 p.m.—V. *Chippenham.* 1·16 in. fell on the 6th, part during a thunderstorm; it fell in six hours, but not six consecutive hours. *Druid, Ashburton.* Rain from 11 a.m. to 6 p.m., 1·27 in.—VI. *The Graig, Ashfield, Ross.* Thunderstorm; 1·57 in. fell between 1 and 10 p.m.—VII. *Welbeck.* Rainfall 1·48 in. *Mansfield.* Heavy rain from 4.30 to 11.30 p.m.; thunder.—IX. *Tickhill.* Fall from 5.30 to 11.45, 1·75. *Warter Pocklington.* Violent thunderstorm, with very heavy rain; 3·62 in. fell in five hours; from 9 to 12 p.m. it fell at the rate of 1 in. per hour. *Ganton Hall.* Thunderstorm. *Old Malton.* The fall, 2·33 in., took place principally between 8 p.m. on 6th and midnight, and very much exceeds any previous 24 hours during the last 13 years.

7th. Fine aurora seen from I. *Harrow,* X. *Gainford,* and XI. *Carnarvon.*

10th. IX. *Tickhill.* High wind.

11th. V. *Ashburton.* Thunderstorm in evening.

20th. I. *Harrow.* S.E. Wind brought down thick heavy smoke from London, making the atmosphere very dense.

21st. XX. *Bruce Villa, Clonmel.* Frost set in.

22nd. VIII. *Hinderton, Neston, Cheshire.* A very beautiful lunar rainbow was seen at 10.45 p.m.—IX. *Tickhill.* High wind.

23rd. V. *Zeal Monachorum.* Wind S.E. at noon, with rain. *Dublin, Fitzwilliam Square.* Thunderstorm.

24th. II. *Uckfield Observatory.* Very heavy shower in morning, when 0·55 in. fell in *less* than five minutes; hail was mingled with the rain. This far exceeded the shower on August 9th, 1870, when 0·33 fell in six minutes.—XVIII. *Budgate, Cawdor.* Frost at night.

25th. VIII. *Holker.* Mountain tops covered with snow.

26th. XXII. *Ballinasloe.* Gale.

27th. X. *West Hendon House.* From 4.30 p.m. to 8 a.m. on 28th 1·13. in. of rain fell; no doubt there was a good deal more on the 27th before I came home. *Gainford.* Wind N.N.W.; rain never ceased during daylight.—XI. *Trevalyn Hall.* Heavy rain set in early, and continued without intermission until early the following morning, the wind being E.; total, 1·64 in.

29th. IV. *West Tofts.* 1·56 in. fell in less than 12 hours. *Picken-*

ham. Quite a gale on this and following day. *Hillington, Norfolk.* Very heavy rain (1·33), accompanied by high wind; the high tides in conjunction with this broke through the sea bank at Terrington, near Lynn, and laid 300 acres of land under water; much alarm was felt.—VI. *Ashfield.* Thunderstorm; rain =1·66.—VII. *Mansfield.* A thoroughly wet day.—XI. *Trevalyn Hall.* Rain commenced at 11 a.m., and was at times heavy; it continued through the greater part of the night, 1·43 in., N.E.—XVIII. *Strathconan.* Hard frost.

30th. I. *Northwick House, Harrow.* Rapid fall of barometer.—V. *Court Barn.* Thunder and heavy rain, 1·50 in.—VIII. *Holker.* Thunder and heavy rain.—XXII. *Ballinasloe.* Gale.

Observers' Summaries for September.

I. *Northwick House, Harrow.* The month began with fine warm damp weather; on the evening of the 7th there was a very fine pale aurora, followed by rain, and then the wind turning eastward brought a fortnight's fine and very dry weather, which ended on the 23rd with a frost, followed by cold heavy rains to the end; commenced fires on the 23rd; swallows and martins left on the 26th. *Winchmore Hill.* No rain fell from the 9th to the 23rd, from which time to the end no less than 4·10 in. fell.

II. *Bromley Common.* The fall, 1·57 in. on the 28th and 29th, is the heaviest fall in 24 hours since July 25th and 26th, 1867, when 2·30 in. fell. *Eltham Green.* The rainfall during the last eight days amounted to 4·69 in., the total for the month being 5·57 in., no rain falling between the 9th and 23rd. *Wantage, Berks.* The rainfall in 10 consecutive days, between the 23rd of September and 2nd of October somewhat exceeded 5·00 in.; a fall of 4·00 in. in a month is unusual, but 5·00 in. in ten days is probably without parallel for very many years past.—IV. *Hillington, Norfolk.* At the beginning of the month the drought was severely felt; grass brown, fodder failing, and butter consequently scarce; root crops pining; the rain on the 6th and 8th beneficial for the moment, but insufficient to revive the grass and turnips; the weather very hot at the beginning, was prematurely chill towards the end. V. *Kilworthy Hill.* Calm, with showers at intervals from 1st to 10th; then fine, though rather breezy; from 23rd to the end stormy, with heavy showers.—VI. *Henley-in-Arden.* A cold month generally, but fine harvest weather till the 23rd, from which day to the end of the month almost incessant rain.

XI. *Llannerch Park.* Weather generally fine till 24th; very wet to

the end of the month. *Trevalyn Hall.* This is the wettest September during the four years I have registered; falls of an inch in 24 hours are rare here, the occurrence of two falls making together more than 3 inches in one week may therefore be considered unprecedented, probably for many years. The beginning of the month was showery and unsettled; from the 11th to the 20th fine, with E. winds, and high bar.; thence showery to the end, some of the falls being very great; temp. reached or exceeded 70° on eight days, and was generally above the average until the 18th; a considerable fall in temp. took place on 24th, and the last week was very cold as well as wet; the max. on 29th was only 50°. *Plas Brereton.* Month chiefly fine and pleasant, easterly winds rather prevalent; water supply yet rather deficient along Menai Straits, sources that cease in June or July, and usually revive in August, being yet dry.

XIV. *Holehouse.* Fine harvest weather in the middle of the month.

XV. *Ballachulish.* Beautiful weather throughout the month, except the first few days, which were wet; on 27th and 28th, the top of Ben Nevis and other mountains contiguous to it, covered with snow.

XVII. *Nairn.* The first half clear and warm, the second cold and stormy, with an occasional bright day.

XVIII. *Strathconan.* Fine harvest weather during the month, except at the Equinox. During the dry weather turnips and potatoes were blighted slightly; some corn is still out, and potatoes are all blackened with frost.

XXII. *Ballinasloe.* Temperature high at early part, gradually getting colder; latter part very cold for the season, with sharp frosts on five nights; sharp cold winds, generally from N., E., and N.E., blowing pretty fresh; no rain from 11th to 21st inclusive.

XXIII. *Carrickfergus.* A great prevalence of easterly wind after the 9th.

OCTOBER.

1st. I. *Winchmore Hill.* A heavy thunderstorm from 1.30 to 2.30; lightning vivid and frequent; ·28 in. of rain.—II. *Forest Lodge, Maresfield.* Very heavy rain from 0 to 8 a.m.—V. *Court Barn.* Thunder.

Guildford.—An extraordinary Hurricane and great destruction of Property.—On Sunday morning, October 1st, this neighbourhood was visited by a thunderstorm, accompanied by a hurricane, the like of which has never before been seen about these parts. The damage done was something tremendous, tiles and slates were stripped off the roof, sheets of lead were rolled up like paper,

chimney pots and bricks fell in all directions, weak bits of old buildings were torn down, and windows were blown in ; but that which proved most conclusively the force and power of the wind, was the havoc which it played amongst the trees, and more particularly at Wonersh. The gale appears to have commenced at Bramley, where a number of trees and a wall were blown down, a granary unroofed, and one of the windows of the church broken. At Church House some beehives were sent flying, and considerable difficulty was experienced in re-hiving the bees. At Bramley Wharf and the field adjoining, about a dozen trees were displaced, several of them falling in the now disused Arun canal, a large piece of lead being also stripped off a storehouse belonging to Mr. Stanton. The fury of the gale became more intense as it neared Wonersh. In the avenue leading from the high road to the church, and near the residence of Lord Grantley, about a dozen elms were cut down, and a number of workmen had to be employed in clearing the *debris* before the morning worshippers could reach the church. Nearly every house in Wonersh-street, as far down as the Guildford-road, was damaged. At Mrs. Lemon's the greater part of the roof was taken off, and about 20 feet of a 10 foot wall thrown down. At Mr. Moore's establishment, a bench in the shop (painter and glazier's) was torn out of its place, and numerous paint pots, bottles, and heavy pieces of lead, were driven against a crate of glass on the other side of the shop, smashing several sheets of the glass. Mr. Moore's stable adjoins the shop, and the wind entered the stable, where it positively "lifted" the horse from one end to the other, and for some time after Mr. Moore thought it would have died, but happily it ultimately rallied. A heavy door at the entrance of Mr. Moore's garden, which was bolted at the time, was carried clean away, and was found about twenty yards off. Trees of all kinds were floored ; a fine lofty aspen tree being shivered to atoms, and one of the branches, too heavy for a man to lift, was afterwards found full half-a-mile from the tree in the direction of Blackheath. The turnpike road to Guildford was completely blocked up and impassable for some hours, a number of tall trees falling right across the road and into the pond. At Lynes farm (Mr. J. Franks) a quantity of wheat-sheaves were carried a distance of 200 yards and upwards. The gale spent itself out just before it reached Blackheath, the extent of country swept by it being about two miles in length, and at no point exceeding 200 yards in breadth. A weaning calf, about four months old, belonging to Mr. Dilloway, was killed while feeding in his orchard, which fortunately is the only loss of life. The wind was accompanied by a peculiarly whistling sound, and the whole damage done, of which we have reported a small portion only, was accomplished in less than ten minutes.

2nd. V. *Clawton.* Thunder.

8th. I. *Winchmore Hill.* Vivid lightning from 6.30 to 9.30 p.m.—XXIII. *Carrickfergus.* Hail at 0.30 p.m.

18th. V. *Druid, Ashburton.* From 6 p.m. very heavy rain all night and the next morning; fall on 18th, 1·28 in.—XV. *Ballachulish.* Gale of short duration.

22nd. V. *Court Barn.* No rain here, but within a mile of this place there was a day's rain; very hard rain between this and Bude, and on

my return wet from that place, I found the roads quite dry as I approached home.

26th. XV. *Ballachulish.* A strong gale from S. and S.W., with heavy showers of rain.

28th. V. *Court Barn.* Very windy from about 10 p.m. to 3 a.m.

30th. V. *Clawton.* Thunder.—XXI. *Dublin, Fitzwilliam Square.* Thunderstorm passed to westward of Dublin at 4 p.m.

31st. V. *Clawton.* Thunder.—VIII. *Astbury, Congleton.* At 6.30 p.m. a brilliant shooting star was seen; it appeared in the E.N.E., at an elevation of about 25°, and travelled towards the N., at an angle of about 45° with the horizon, disappearing in a cloud about 10° elevation; its light was white, of rather a bluish tinge, and its brightness quite equal to Venus at her greatest brilliancy; the train seemed to disappear after a second or two.

Observers' Summaries for October.

IV. *Diss, Norfolk.* Public health good; foot and mouth disease epidemic among neat cattle.

V. *Chippenham.* No heavy rain. *Kilworthy.* Not much wind during the month.

VII. *Mansfield.* The month of October has been throughout a dull and unpleasant one; though no great amount of rain has fallen, yet wet days have been frequent. It is noteworthy, that though rain has fallen on 16 days, the total fall has only been 1·93 in.

VIII. *Astbury, Congleton.* First week rainy, second very fine, but cool, rest of the month rainy and mild; by the end of the month all the limes and horse-chesnuts were bare of leaves.

XI. *Llannerch Park.* Weather generally mild. *Plas Brereton.* Temp. regular, and wind S. and its compounds on every day but four.

XV. *Ballachulish.* On the whole a very wet month; potato crop secured—one-third of it diseased in this district; wintering for cattle and sheep plentiful; stock in good condition, and free from any disease.

XVIII. *Strathconan.* The month has been very wet in its early and latter parts; beautiful weather about the middle, of which farmers availed themselves to secure their excellent potato crop; in this quarter and upon the upper grounds, late corn has been also secured in good order.

XXII. *Ballinasloe.* Temp. equable, weather generally wet, evapora-

tion small, bar. unsteady, winds generally high and fresh, prevailing winds S. and W.; gales of short duration on 13th and 18th.

XXIII. *Carrickfergus.* Only four days without S. wind.

NOVEMBER.

5th. IX. *Ganton Hall.* Storm; very cold.

9th and 10th. Aurora on both nights, seen from all parts of the country. X. *Casterton, Kirkby Lonsdale.* Brilliant flashes of lightning about 5.30 p.m.; from 9.45 p.m. to 10 p.m. there was a grand display of aurora, spreading over two-thirds of the sky; the streamers were very fine, and of various colours, rose predominating at the point of convergence, viz., Andromeda.—XVIII. *Strathconan.* Snow.

12th. Cold. At XX. *Clonmel*, min. temp. 19°.

12th—14th. Very few meteors seen, though a good look-out was kept at IV. *Diss*, VII. *Mansfield*, and other places.

15th. II. *Forest Lodge.* Thunderstorm.

16th. Snow in the midland counties; slight aurora at night.

17th. II. *Forest Lodge.* Snow.—IV. *Diss.* Heavy snow storm, commencing at 4 a.m., and continuing occasionally during the day. *West Tofts.* Snow and hail.

23rd and 24th. Very foggy, especially in the midland counties.

27th. XXI. *Dublin, Fitzwilliam Square.* Thunderstorm, with rain and hail, at 5 p.m.

30th. VII. *Mansfield.* Snowing heavily all day.

Observers' Summaries for November.

I. *Harrow.* The weather has been very cold, prevalent wind N.; min. 13°·0 on 18th; fine aurora on 9th, 10th, and 17th, the latter at 1 a.m.

II. *Bromley Common.* Mean of temp. 4°·3 below that of eight years.

IV. *West Tofts.* Rather singular that the rainfall this month should be exactly the same as last month (October), an instance I have never met with before; snow on last four days. *Diss, Norfolk.* First half of month singularly clear and fine, white frosts like fine Christmas weather; latter part damp and cold, ice bearing on 21st and 22nd, but thawing in the evening of the latter day.

V. *Holsworthy.* Unusually mild, dry, fine weather on the whole, and more like a March month; hard frost from 26th to the end. *Kil-*

worthy. Generally fine through the month, prevalent winds N. and N.E., but mostly calm.

VII. *Mansfield.* The month for November has been fine and pleasant; auroræ were observed brilliantly on the 9th, and with fainter lustre on the following few days; on the 9th they were very fine, a brilliant whitish arch of light spanning the heavens, which gradually broke up into pillars of fire; no meteors were observed on 12th, 13th, or 14th, though diligent watch was kept; snow fell slightly on the 16th, and heavily on 30th. *Southwell, Notts.* The weather very bright and clear to 21st of this month, from 22nd to 26th more or less foggy (the 23rd and 24th being the worst days), from 26th to 30th very cloudy, scarcely any sunshine.

XI. *Plas Brereton.* Winds generally cold, but temperature not low enough (except on two or three nights) to produce frost, which was only very slight.

XII. *Dumfries.* General direction of wind W. and N.W.; a damp sunless month.

XIV. *Holehouse.* The rainfall for the month has been light, and although unusually frosty, has been on the whole very favourable for agricultural operations.

XV. *Ballachulish.* On the whole a fine month for November, stock of all kinds in good condition, plenty of pasture and wintering for them.

XVIII. *Strathconan.* Fine winter weather throughout, except some rough weather from 7th to 11th.

XXII. *Ballinasloe.* Temperature generally low; hard frost on several nights, wind generally moderate, E. most prevalent.

DECEMBER.

1st to 12th. Severe frost general throughout the central and eastern parts of England, also in the south of Ireland, the temp. on the 5th falling at XX. *Clonmel,* to 18°·5.

20th. V. *Kilworthy Hill.* A very high wind. *Bodmin, Fore Street.* A great storm of wind all over Cornwall, from 8.30 a.m. to 4 p.m., from W. and S.W.—VI. *Saul Lodge.* A violent gale.—VII. *Mansfield.* A very stormy day and night.

Observers' Summaries for December.

V. *Holne Vicarage.* All the entries prior to the 15th represent dew or condensed fog, and not rain. *Druid, Ashburton.* First half of the

month very calm, scarcely any wind perceptible, bar. high, nights cold, during the latter half strong gales and storms, and low bar.; very frequent fogs during the whole month. *Kilworthy Hill, Tavistock.* Dense fogs in the mornings, nearly throughout the month. *Clawton, Holsworthy.* First week remarkably mild, notwithstanding slight morning frosts, it was free from wind.

VII. *Mansfield.* The early part of the month cold, the latter part much warmer, many of the days towards the end being remarkably bright and pleasant.

XV. *Ballachulish.* The weather began with open showery weather, but as a whole it was wet and boisterous.

XVIII. *Strathconan, Ross-shire.* The month during the greater part of the month was favourable for out-door work; whenever any rough day occurred, it was passed over as "no wonder, after all the fine weather." The rain of the 19th, 1·03, raised the Meig river, which flows through Strathconan, to its greatest height.

XXII. *Ballinasloe.* The month set in with sharp frosts, which continued to about the 9th, when it broke up altogether; rest of the month very unsettled; westerly winds prevailed in the latter part of month, northerly in the early part.

OBSERVERS' NOTES ON THE YEAR 1871.

ENGLAND.

DIVISION I.—MIDDLESEX.

TEDDINGTON.—The heaviest fall of the year was July 10th and 11th, when 1·24 in. fell, with a N. and N.E. wind. The fall of the year is still considerably below our average.

DIVISION II.—SOUTH EASTERN COUNTIES.

GUILDFORD ROYAL GRAMMAR SCHOOL.—Three days on which 1 in. or more fell, viz., July 10th, 1·33; Sept. 23rd, 1·02; and 29th, 1·12; six on which more than half an inch, and less than an inch fell, and twenty-six on which a quarter and less than half an inch fell.

RIVER HILL.—The heavy rainfall of July 9th (1·56) fell without wind.

BECKENHAM (PARKSIDE).—The most noticeable features in the meteorological elements of 1871 were as follows:—*Rain.*—April, June, and July each exceed 3 in.; August to December all very dry, with the exception of an isolated period of eight days, 23rd to 30th September, in which the excessive amount of 4·518 fell, being more than half of the total amount which fell in those five months; the total for the year 24·143, differing very slightly from the average. *Temperature.*—Some large monthly differences from the average: January and June each 4° below, and November as much as 6° below; a long period of very cold weather from 4th November to 12th December, the mean of December 8th being as low as 19°·5; February and March very warm for the season, and August very hot; the only really hot period of any continuance was from 6th to 22nd August, the mean for the year was 48·4, or ·6 below the average. The cold weather which set in just at the Autumnal Equinox, prevailed generally throughout the quarter. The *barometer* never reached any particularly high point, the highest being 30·515 in. on the evening of 8th December, the lowest 28·886 on 16th January. The readings were remarkably uniform from 13th to 18th September, and 22nd to 26th October. A very sudden rise of just 1 inch from 16th to 17th of March, immediately after which

ensued a very calm period of eight days. *Wind.*—An unusually calm year, the pressure only on three occasions exceeding 15lbs. on square foot, viz., 16th January, 15·5 lbs.; 9th March, 16·9 lbs.; and 20th December, 20·3 lbs., the maximum for the year; there were 80 days which might be considered calm, 16 of which were in October. May, September, October, and November, were all exceptionally calm, the daily horizontal motion of the air being 177, 179, 160, and 172 respectively. February, April, and July were the most windy, the daily horizontal motion being 298, 280, and 280 respectively. Calm at both Equinoxes; rough and unsettled at both Solstices.

Steyning.—The division of dry and wet periods is remarkable. Dry periods lasted once for 15, twice for 17, and seven times for from six to nine days; but from March 16th to April 10th inclusive, there was a dry period of 26 days only broken by three slight falls, of which the total was only 0·11. This was followed by a period of extraordinary heavy rains until the dry 15 days at the beginning of May.

Pevensey.—I have never, during my tenure of office (30 years) had occasion to stop back water for the use of the stock in these levels at so late a season of the year as this year.

Uckfield.—The rainfall has been 3·74 below the average, which, with the deficiency of 4·39 during the previous year, makes a deficiency of 8 inches during the two years. With the exception of April, 1856, so much rain had not fallen in April for 30 years past. About the middle of December, water was very scarce, and nearly all the water-mills were at a stand-still.

Maresfield, Forest Lodge.—The average amount of rain which has fallen at this station during the preceding 15 years is 30·12 inches, consequently the quantity measured during 1871 (30·45) is 0·33 in excess of such average. September was the wettest month, although in this respect June approached it very closely; the largest amount which fell in 24 hours was measured at 9 a.m. on October 1st, when 1·03 inches were found in the gauge. Although this is entered according to custom, against 30th September, it very nearly all fell between midnight on that day and 8 a.m. on October 1st. March, May, August, and November, were very dry months here, the supply of water falling short. Snow fell on 15th March. July and August were exceedingly hot months. During the middle and end of November we had very hard frosts; aurora on several occasions.

Leigh Park, Havant.—No fall of as much as one inch in 24 hours during 1871.

CADLAND, SOUTHAMPTON.—The rainfall here for the year 1871 is 7·85 in excess of that of 1870, and 1·32 above the average of the 11 previous years.

ELING HOUSE, SOUTHAMPTON.—The rainfall of the past year exceeds the average by several inches, and is nearly one-third more than in 1870. It is remarkable for the extreme fall in the months of July and September, and which, with August, were equal to any other six months. The month of September, usually the driest, was the wettest in the year, and has scarcely been exceeded during the present century.

SHIRLEY WARREN.—The month of May, a most trying time. Currants not only blighted by the drought, but actually killed and turned black; apple-trees infested with aphides, and so injured that they never recovered, and the fruit never came to maturity.

OTTERBOURNE.—Remarkably dry October and November.

BASINGSTOKE, CHAPEL HILL.—Hottest days, August 12th and 13th, 87°. Coldest, January 5th, 6°.

LYNWOOD, SUNNINGDALE.—Mean temperature of November, 37°·9; mean of night, 32°·2; lowest in November, 19° on 19th; December, mean 37°·1; night, 32°·2; lowest, 8° on 18th.

DIVISION III.—SOUTH MIDLAND COUNTIES.

BROUGHTON, NEAR BANBURY.—We had a very heavy fall of rain here (4·49) during the last eight days in September, 23rd to 30th, of which 1·65 fell on 29th.

WARESLEY.—Mean fall of nine years, 21·525; mean number of days with rain, 125·5; maximum during the period—daily, 1867, May 10th, 1·70; monthly, 1865, October, 5·87; yearly, 1865, 26·48. Minimum during the period—monthly, 1868, July, 0·13; yearly, 1870, 15·47.

CARDINGTON.—1871, 19·69; average (26 years), 21·51; number of days 1871, 133, the average being 150.

ABINGTON PIGOTTS.—The rainfall for the year was 1·937 below the average, but fell on 14 days more than the average—Frosty nights in air, 101; on grass, 158. The wettest September I have noticed, and the severest weather in November.

DIVISION IV.—EASTERN COUNTIES.

AUDLEY END, SAFFRON WALDEN.—Mean of barometer, 29·962; highest, October 12th, 30·504; lowest, January 16th, 28·879; mean maximum temp., 55°·7; mean minimum, 39°·9; highest temp., 88°·4,

August 13th ; lowest, January 2nd, 9° ; mean daily temperature of the earth six inches deep, at 9 a.m., 48°·03 ; at 12 inches, 49°·49 in light garden soil.

DICKLEBURGH.—Mean temp., from 7th to 14th of August inclusive, averaged 86°·1, while in December, from the 7th to the 12th, the mean min. was 19°·1 ; on the 8th it was 9° ; and on the 9th 10°.

GELDESTON.—September very wet, and the unprecedented fall of 2·06 on 29th. April also very wet.

PICKENHAM, SWAFFHAM.—January cold, with much snow and hard frost ; February wet and cold ; March warm until 12th ; snow on 15th ; then warm till 18th ; snow again, and much cold N.E. winds : mild at the end of the month. May dry and cold, with N.E. winds. June very cold first ten days—fires required ; wind N.E., with snow and rain, made it a very wretched month. July wet and stormy ; thunder at the end of the month. August dry and fine ; corn ripe all at once. September dry early part, then stormy heavy rain, with wind from E. and N. ; 29th and 30th quite a gale. October very fine and mild. November cold and fine till 22nd, then unsettled ; wind N.E. December, much snow on 7th ; ther. below zero ; very cold till the 11th ; great numbers of wild fowl inland ; latter part of the month very mild and fine.

NORWICH LITERARY INSTITUTION.—The amount of rain which fell on the 29th of September, 1·64, is the largest quantity registered here in 24 hours during the past 31 years, with three exceptions in August, 1843, July, 1853, and August, 1854. During the week from 23rd to 29th of September, 3·18 inches were measured. The total fall for the year is nearly 0·5 in. below the average of 30 years, but it exceeds that of last year by 4·26 inches.

DIVISION V.—SOUTH WESTERN COUNTIES.

IMBER VICARAGE.—Our springs did not break last winter, and in the middle of May the water in our wells stood a little higher than at any time during the previous winter.

OSMINGTON LODGE, NEAR WEYMOUTH.—Our average (5 years), being 32·68, 1871 has been 1·77 in excess. *As a rule*, thunderstorms divide and pass on either side of this place, but last year was an exception.

LAMORNA, TORQUAY.—The rainfall in March, May, and November, was less, and that in April greater than in the same months during any of

the preceding seven years. The rainfall during the eight days, 23rd to 30th of September (of which the 24th was rainless), amounted to 5·20 in., and exceeded that of any other eight consecutive days during the eight years ending with Dec. 31, 1871.

Lee Moor.—In the week ending April 22nd, 6·25 inches fell, the total of the month being 10·50. In the week ending Dec. 30, 5·55 inches fell, and although only 0·38 fell up to the 16th December, the total fall for the month was 9·34.

Jacobstowe.—There has been an increase of rainfall here, compared with that of 1870, of 10·85 inches.

Brampford Speke.—Average rainfall 1865-70 inclusive was 33·62; fall of 1871, 34·24. May of 1871 was very dry. April, June, July, and September were very wet, the last-named being 2·26 over the average. November and part of December very cold. The rainfall in April was 3·29 over the average of six past years.

Zeal Monachorum.—Frosty on 24 mornings in January, 4 in February, 4 in March, 3 in April, 10 in May, 8 in June, 3 in July, 8 in August, 5 in September, 11 in October, 17 in November, and 17 in December. Total 111 days. Gales on 18 days in January, 18 in February, 11 in March, 11 in April, 12 in May, 9 in June, 12 in July, 13 in August, 15 in September, 13 in October, 13 in November, and 13 in December; total, 158. Wind force on those days 6 to 9. Foggy on 27 days, the largest number being in August. Thunder several days. I only saw lightning on two nights. March fine weather for planting and sowing; early spring. The oak and ash came into leaf at the same time; first seen on 28th of April. May 10th to 16th cold and windy, generally E. Falling stars seen at 10.30 p.m., on 8th to 10th August. Early part of December cold; change took place on 13th, then very windy.

Clawton.—Thunderstorms on 1st, 2nd, 29th, 30th, and 31st October. [None of these are noticed at any other West of England station.—Ed.]

Great Torrington.—The average for eight years, 1863-70, being 39·16, the rainfall for 1871 is 1·38 below it, and only ·25 above that of 1863; it was much more equally divided than in 1870, the first two quarters were the driest. May was the driest month. January, February, March, May, August, November, and December were below the average for these months respectively, especially May. The other months were in excess, and October was again the wettest month in the year. Thunder only twice near us, though heard at a distance on

four other occasions. The rainfall here has not reached 1·00 on any day, though it has exceeded ·75 on five days.

Meshaw Rectory.—Mean rainfall past ten years, 39·3 inches; mean number of days on which rain has fallen in each year, 184; mean shade temp., 46°·1; highest recorded, 82°·0; lowest, 12°.

Bampton.—The rainfall here on the 6th, 27th, and 29th September was respectively 1·31, 1·00, and 1·08; total, 3·39.

Buckish, Bideford.—An inch and upwards was registered on four days in September, namely, the 3rd, 8th, 24th, and 29th.

Crowan is four and a half miles distant from Camborne, Hills chiefly granite. It is worthy of notice, that there has less rain fallen at Crowan during 1871 than at Camborne, 200 feet lower.

Bodmin (Fore-street.)—In September, I registered four inches in three days, viz., 1·21 on 8th, 1·57 on 9th, and 1·22 on 29th. It was a very wet month, 3·00 inches above the average.

Bath Institution.—The fall during the months of April, July, and September, was greatly above the average, but in every other month there was a deficiency. The entire fall of the year was 0·529 inches below the average of the previous eleven years.

Bincombe House.—July a wet month on the whole; September the latter part wet; December cold and calm at the beginning, but high gales in the latter part.

DIVISION VI.—WEST MIDLAND COUNTIES.

Upfield House, Stroud.—The hottest day was May 24th, 83°, the hottest night that of July 16th, 63°; the coldest night, December 8th, 19°; seven days from 9th of August averaged 81°.

Saul Lodge.—The meteorological character of the year 1871 has been only of an ordinary kind, except, perhaps, the unusually low range of the barometer during the latter part of the month of June, through July, and into the first week in August, and a considerable absence of sunshine during the period. The rainfall is nearly 3·00 inches above the average.

The Craig, Ross.—Rainfall 3·00 in. above the average; September the greatest amount (6·62) in one month since November, 1852; fall pretty evenly distributed through the year. There were three specially heavy falls in thunderstorms on 12th and 13th August, together 1·50; Sept. 6th, 1·57, and Sept. 29th, 1·66, otherwise the falls in 24 hours were not heavy. 4·20 fell in the week ending Sept. 30th. Dry periods, March 15th to April 11th, and (except the 24th and 25th),

May 1st to June 12th, the first 11 days in August, the first 20 days in November, and first 18 days in December; November particularly cold and dry.

STRETTON RECTORY.—There were 18 days in 1871, three of them in May, on which the maximum temp. in the shade was over 80°. On two days, the 9th and 10th of August, it exceeded 90°. On the nights of the 2nd and 4th of June, the min. ther. registered 34°·0 and 33°·5 respectively. Potatoes were cut to the ground, and much damage done.

LUDLOW (MILL STREET).—From the 31st of October to the 18th of December, both included (49 days), only ·78 of rain fell.

EVESHAM.—1866-71, six years mean fall, 25·04; maximum in any year (1866) 33·16; minimum in any year (1870) 15·95. 1871, 25·23.

WEST MALVERN.—The wettest year I have recorded since my observations commenced in March, 1861.

THE FORD HOUSE, BROMSGROVE.—Snow on the ground from Dec. 20th to Jan. 14th. January the coldest month I have recorded; June, July, and August, thunder prevalent; solar ther. above 100° on 13 days in August. September the greatest monthly fall on record in that month, 6·08, except Sept., 1869, 6·12. The coldest November on register.

HAGLEY RECTORY.—Month of June extraordinarily cold.

COVENTRY.—Rain measured in 1867, 27·77; 1868, 27·44; 1869, 27·35; 1870, 21·30; 1871, 24·91.

STRETTON HOUSE, HINCKLEY.—Average of five years = 25·29; there is consequently a deficiency this year of 2·16.

DIVISION VII.—NORTH MIDLAND COUNTIES.

BRANSTON HALL, LINCOLN.—The fall here, 23·38; the fall at Long Hills, about a mile S.E. from here, was 1·83 in excess of this amount.

WELBECK ABBEY, NOTTS.—The rainfall for 1871 (25·48) was only half-an-inch above the average, but the number of days on which it fell was considerably above. April, June, July, and September were very wet months, the number of rainy days in the four months being 61. September was the wettest month in the year, the rainfall 5·31 in., the heaviest fall being on the 6th and 29th. The year commenced with a very severe frost, and all through January the weather was very changeable, and at times severe, doing great injury to vegetables, and to the young wheat crops; the spring months were also cold and ungenial at times. The fruit-tree blossom being so much blighted, that a very partial crop was the result. June and July were wet and cold

for the season, but the tropical heat in August forwarded the harvest, which turned out better, both as to earliness and yield, than was at one time expected. The heavy rains in September brought on the potato disease, which on some soils was *worse* than ever before experienced. October and November were favourable months for field labour, for sowing the winter wheats and securing the root crops; but in December the frost set in very severely, the mean temperature of the 8th being only 27°; when such severe frosts occur in December the following winter is often open and mild, and it has been so up to the beginning of the year. The mean temperature of 1871 at Welbeck has been 47°, which is 1° below the average of the last 20 years.

BRAMPTON, DERBY.—December unusually cold.

DIVISION VIII.—NORTH WESTERN COUNTIES.

HINDERTON, NESTON, CHESHIRE.—The rainfall of the first few months of the year was decidedly below the average, only reaching 6·95 in. by the end of May. March was very dry, there being only four rainy days. June and July were both wet and cold months; in the former the thermometer only reached 70° once, and in the latter three times. The most notable feature of the year here, as I suppose elsewhere, was the heavy fall at the end of September. I had not registered an inch of rain in 24 hours since September 11th, 1869; but this amount was more than reached on the 27th and 29th of the same month this year. The heaviest fall of the year, viz., 1·16 or 4·5 per cent. of the year's total took place on the latter day. October was the wettest month of the year, the fall being 4·60; in this month and September together, more than one-third of the year's total fell. The fall of November and December was rather small, bringing the total to what I believe to be very nearly the average of this district. The December frost was tolerably severe here; the lowest temperature was on the 8th, 19°·3 in the shade and 14°·9 on the grass. The lowest temperature of the year was on January 1st; 11° in the shade.

BOLTON-LE-MOORS.—The fall in 1871 (40·93) was 2·54 in. less than the fall in 1870, and 6·20 less than the mean of the previous 40 years.

SOUTH-SHORE, BLACKPOOL.—Average rainfall of the last 16 years, 31·52; the present year, 29·94 is, therefore, 1½ in. below the average.

DOWNHAM HALL, CLITHEROE.—This has been the wettest July (7·24) I have registered in 17 years, and, with the exception of 1855 (1·11), the driest November (1·34).

STORR'S HALL, CARNFORTH.—The spring and early summer in this

part of the country is but little wetter than in the neighbourhood of London. The winter months, December, January, and February, are much wetter, and much more rain falls here in the autumn months than near London. The fall this year is 6·00 in. below our average.

DIVISION IX.—YORKSHIRE.

BALNE VICARAGE.—The average rainfall for the four years 1867—1870, was 25·498. This year (29·255) is therefore 3·757 in excess.

STONEHOUSE, DENT.—On the whole, an ungenial summer.

SEDBERGH.—The tables are made (as desired) to the date *preceding* the morning of observation. In 27 cases no rain fell till after midnight, amounting to 5·05, which *may* have fallen on the date of observation; that is, after midnight. [If our correspondent will be good enough to work out a similar analysis of observations entered on the other mode, she will find the error greater in the ratios of 5 to 3, if not in this individual year, most certainly in any series of years she may select.—ED.]

WARTER, POCKLINGTON.—The rainfall, as registered here, is $3\frac{1}{4}$ in. above the average of the previous five years; the wettest months were July (4·17), and September (7·81).

GANTON HALL GARDENS.—It has been a year remarkable for sudden changes of temperature, much wind, and a cold summer; continuous rains in July, but no storm; September wettest month; much frost and snow in November.

DIVISION X.—NORTHERN COUNTIES.

SEAHAM VICARAGE.—Remarkable frequency of thunder in July, there being more or less on 19 days.

WEST HENDON, SUNDERLAND.—In 1871 the wettest wind (in proportion to the length of time it blew) was the S.E.; the next the E.; the driest were the S.W. and W.; the first being more than four times as wet as the two last. January 1, the lowest day temperature I recollect; maximum 21°, with a bitter S. wind; the ground was covered with snow six inches deep, most of which fell the previous week; this was the thickest covering of snow in 1871.

DEADWATER.—No particular rain fell at any time; very steady fall all the year round.

BRAYSTONES.—The rainfall in 1871 (32·92) was 1·75 in. more than in 1870, and 2·77 in. less than the mean of the previous seven years.

MIREHOUSE, BASSENTHWAITE.—Cold summer till August, with much drought; rainfall about 10 in. below the average.

WHINFELL HALL, COCKERMOUTH.—The rainfall here in 1871 (41·70) was 2 in. less than that of any of the preceding 15 years; the next lowest being 1856, the first of the present series. The average of the whole 16 years is 53·87 in., deficiency in 1871, 12·17 in.

CASTERTON, KIRKBY LONSDALE.—July all kinds of weather (except fine), rain, hail, and wind being the order of the day, only three days on which no rain fell, the result being that not more than a quarter of the hay crop has been housed, whereas this time last year all the grain crops were got in; 79 nights on which the temp. fell to or below 32°. Prevailing wind S.W.; mean amount of cloud 6·8.

DIVISION XI.—MONMOUTH, WALES, AND THE ISLES.

LLANFRECHFA GRANGE.—The autumn unusually exempt from heavy gales.

TUTSHILL, CHEPSTOW.—The wettest year in my register, which dates from 1860 inclusive.

PRESTEIGN.—January cold winds; 24 days and nights of hard frost; February fine at the end; March early part warm; third week warm again; fourth week cold and fine; April a fine growing month; May cold, crops much checked; June a cold ungenial month; July a cold wet month, much hay spoilt, last three nights frosty; August sharp frosts on several nights, in the first week heavy dews and great heat; crops ripe all at once; September hot, and very cold; October a fine month on the whole; November high winds, latter end very cold; December, early part very cold, high winds, latter part very warm.

TREVALYN HALL, ROSSET, WREXHAM.—Rainfall about the average of the district; the excess in July, September, and October was considerable, but was compensated for by the unusually small falls of August, November, and December. The total fall exceeds that of 1870 by 4·75 in., and is less than the amount in 1869 by ·53. July was remarkable for the great number of rainy days, which rendered the completion of the hay harvest very difficult in this district. The rainfall in the last week of September was extraordinarily large, more than 3·50 having fallen within eight days. The number of rainy days in the year, 191, exceeded the total in 1870 by 34.

PLAS BRERETON.—Nearly 3 in. below mean of the last seven years.

HARBOUR WORKS, ALDERNEY.—The average at this station for the last 21 years is 28·20, so that the rainfall for 1871 (27·18) is 1·02 in. below this average.

SCOTLAND.

DIVISION XII.—SOUTHERN COUNTIES.

March Hill Cottage, Dumfries.—The rainfall for the year is 7 in. above that of 1870, and ·62in. above the average of five previous years. In January, there was more snow than had been seen for many years February was wet and mild. The first half of March was very coarse. April was a wet month. May dry, with occasional frosts at night; and the early part of June very arid; grass burned up, and crops stunted on gravelly soils. July wet throughout. August a favourable month for the harvest; and September also propitious, and crops early secured. In the beginning of December the frost very severe; skating and curling general.

DIVISION XIV.—SOUTH-WESTERN COUNTIES.

Ridge Park, Lanark.—I observe that the gauge 12 inches above the grass almost invariably denotes ·01 less than that 4½ in., except during high winds, when the difference is much greater and more variable, denoting sometimes as much as ·05 less. If I dared venture to give an opinion, it would be that in a high and exposed locality like this is, the gauge raised 4½ in. above the grass would give the most correct result, as I consider that placed on grass there would be little danger of falsification from the rebound.

Bothwell Castle.—This year the rainfall is about our ordinary average, but the fall in August was excessive, especially on the 18th, when we had 2·81 in.

Newton Mearns.—Total about the average, and very evenly distributed throughout the year.

DIVISION XV.—WEST MIDLAND COUNTIES.

Inverary Castle.—The year commenced with frost and snow, which remained for some months, and when winter broke up the heat of the sun melted the ice and snow, and but little rain fell, which caused a light hay crop, but the chief injury was done by the severe frost in the latter part of May, which left the foliage withered up; fruits also suffered. Although the potatoes looked well in June and July, the rain which set in in August destroyed them very much. The year has been changeable and cold.

Bridge of Orchy.—The rainfall (15·35) must have been exceptionally heavy in September; there can be no mistake as to the return

sent, and the observer rarely makes mistakes in his figures—it might be caused by an unusually heavy local fall at some time in the month. [Note by A. MacDowall, Esq.]

AIRDS.—1871 has been the driest year since 1857, the average, 1858-1870 inclusive = 63·30, 1871 = 50·70 only, being 12·60 in. below the average.

DIVISION XVI.—EAST MIDLAND COUNTIES.

LENY, NEAR CALLANDER.—Heavy fall of snow, 22 in. deep, on New Year's Day. A very protracted spring, horse chesnuts showing green heads on the 5th of March, and leaves not being developed till near the end of April.

DIVISION XVII.—NORTH-EASTERN COUNTIES.

ARNHALL, KINCARDINE.—Wind N., 74 days; S., 36 days; E., 101 days; W., 154 days; total, 365.

LEOCHEL, CUSHNIE.—The rainfall in 1871 (29·37) has been less by 2·68 in. than any year since observations have been taken here, the next driest being 1868, 32·05; the wettest year, 1867, exceeded 1871 by 8·13 in.; the max. total fall of any month was July. Several thunderstorms and heavy falls of rain; crops of all kinds excellent; springs very low.

INVERURIE MANSE.—The quantity reported from July to October may be slightly deficient, as the gauge was this year in a potato plot, and was for a time overtopped by the stems.

DIVISION XVIII.—NORTH-WESTERN COUNTIES.

SPRINGFIELD, TAIN.—As I stated in a note some months since, I fear my measurements indicate more than the actual fall.—[A new gauge recently supplied.—ED.]

BEAUFORT CASTLE GARDENS.—No particularly heavy rain registered here during the year. Frost continued a good deal through the months of January and February; August and September particularly fine.

IRELAND.

DIVISION XXI.—LEINSTER.

DUBLIN (FITZWILLIAM SQUARE, WEST).—In July thunder recorded on 7th, 8th, 10th, 23rd, 28th, and 29th.

DIVISION XXIII.—ULSTER.

ALMA HOUSE, SYDENHAM, COUNTY DOWN.—The total rainfall for 1871 was 32·95 in., or ·81 in. below the average of the previous years, 1867-70 inclusive, the monthly distribution being also abnormal, May registering only ·42 in. against 3·05, the average of the four years previous. On the other hand, June and July were characterized by excessive humidity, the former being 1·18 in. and the latter 2·17 in. above the same average.

MONEYDIG, GARVAGH.—Seed-time up to April 11th, very good; and very bad thence to 4th of May; month of May dry and scorching; from 18th to 26th of June fine hay weather, after which for 34 days only four dry ones, and not two of these together. Potatoes have not been so bad since 1846. Flax, except a little sown in the end of the first week in May, all but a total failure. More than nine-tenths of the upland hay half lost in the saving. Fair crop of grain.

THE PRINCIPAL HEAVY RAINS OF 1871.

JANUARY 17TH.

A fall of snow and rain, was general on this day, but not at all heavy, except at a few stations between the Isle of Wight and Sevenoaks, those on the South Downs having from an inch to an inch and a half. The maximum was at II. Steyning, 1·52 in., being 4·3 per cent.

APRIL 11TH.

The heavy fall on this day was confined to a few detached stations in South Devon, South Wales, North Lancashire and Northumberland. The amounts were generally about 1½ inches, and the maximum was at V., Holne Vicarage, 2·25 in., being 3·2 per cent.

APRIL 18TH AND 19TH.

Falls exceeding an inch occurred in Dorsetshire on the former date, and on the east coast of Scotland on the latter day, but they were of little importance, and do not claim further notice.

MAY 25TH.

There appears to have been a somewhat heavy thunderstorm in Worcestershire, Staffordshire, and Warwickshire. The following are a few of the largest falls and per-centages :—

Div. VI.	Arden House	1·99 in.	=	6·8	per cent.
,, ,,	Evesham	1·92 in.	=	7·6	,, ,,
,, ,,	Stanley	1·80 in.	=	5·1	,, ,,
,, ,,	Selly Hall.....	1·55 in.	=	5·3	,, ,,

JUNE 14TH.

In the south and south-east of England, the fall on this day was the product of a thunderstorm, beginning about 10 p.m., lasting about a couple of hours, and being most severe in the neighbourhood of Brighton.

JUNE 15TH.

We must preface our notice of the heavy rain of this day by remarking that it commenced about the same time on the 14th as the storm was raging at Brighton, but while the Sussex storm terminated

before midnight, the Midland fall, which we are about to consider, continued steadily all through the early morning hours of the 15th, and with only a slight respite until 7 or 8 p.m. on the 15th, thus making a nearly continuous fall for about twenty hours. Under these circumstances, the amount obviously fell partly before, and partly after the usual hour of measurement. This is a contingency inseparable from *any system* of uniform records, and can only be met by a little care on the part of the observers. We are extremely glad to refer to page 88 for evidence of this carefulness on the part of more than one of our correspondents, and proceed to utilise the data they have provided.

		JUNE 15TH.	JUNE 14TH & 15TH.
Div. III.	Thorpelands.....	1·44 in. = 6·6 per cent.	
Div. VII.	Wigston	2·00 in. = 8·2 ,,	2·75 in. = 11·3 per cent.
,,	Belmont Villas ...	2·58 in. = 8·6 ,,	3·62 in. = 12·0 ,,
,,	Freeman's Common		2·99 in. = 11·5 ,,
,,	Ruddington Grange	1·30 in. = 5·0 ,,	
,,	Trent College	2·28 in. = 8.1 ,,	3·08 in. = 10·9 ,,
,,	Swanwick	2·29 in.	2·84 in.
,,	Brampton	2·22 in. = 7·4 ,,	2·76 in. = 9·4 ,,
Div. IX.	Sheffield	2·32 in. = 7·5 ,,	2·68 in. = 8·7 ,,

JUNE 17TH.

A thunderstorm on this day produced heavy falls over Bedfordshire, and parts of Cambridgeshire and Huntingdonshire. The maximum was at Sandy Rectory, Beds, where 2·07 in. fell, which was 9·5 per cent. of the total fall in the year.

JUNE 25TH.

A local rain of between 1·75 and 2 in., confined to the vicinity of Derby. Maximum 1·97 in. (= 6·6 per cent.) at West Hallam.

JULY 4TH.

Detached thunderstorms produced falls of between 1 inch and $1\frac{3}{4}$ inches at several stations, the maximum being 1·73 in. (= 6·6 per cent.) at Middlesborough.

JULY 10TH.

A steady and continuous rain over the south of England, unaccompanied by thunder; the heaviest fall in the year at upwards of 70 stations. A few of the more important amounts are given below, and we need only add that the average fall, over the triangular space enclosed by lines joining Bath, Margate and Ventnor, (say 5,000 square

miles) was 1½ inches, while outside these lines there was at least an equal area, with an average fall of an inch :—

Div. II.	Swanmore House	2·23 in.	=	6·8 per cent.
,, ,,	Cadland, Southampton..	2·01 in.	=	6·0 ,, ,,
,, ,,	Alresford	2·00 in.	=	6·4 ,, ,,
,, V.	West Dean	1·95 in.	=	7·1 ,, ,,
,, II.	Basingstoke	1·90 in.	=	7·2 ,, ,,

AUGUST 13TH.

The fall of this day was solely the product of the thunderstorm, already fully reported by our correspondents on page 98, whence also it will be seen that it was mainly confined to the west of England. Max: at VI. Studley, 2·55 in. = 8·5 per cent.

AUGUST 14TH.

Other storms, also fully reported, occurred on this day at a few stations on the borders of Dorset and Somerset, and at one or two places in Cornwall. Max: at V. Melbury, 4·24 = 9·8 per cent.

AUGUST 18TH.

Thunderstorms with heavy rain, at a few detached stations on the coasts of the Irish Sea. Max: at X. Underfell, Kendal, 3·19 in. = 6·5 per cent.

AUGUST 20TH.

The area over which more rain fell on this day than on any other during the year was very similar to that on the 18th. It includes North Lancashire, Westmoreland, Cumberland, the Isle of Man, Roxburgh, Lanark, Ayr, Antrim, and Down. The max. was at Low Nook, Ambleside, 2·95 in. = 4·1 per cent.

SEPTEMBER 6TH.

This was one of the most remarkable rains of 1871, both for local largeness of fall, high per-centage, and the length and sharply defined breadth of its path.

Div. IX.	Warter, Pocklington.....	3·62 in.	=	11·5 per cent.
,, ,,	Holme on Spalding Moor...	3·19 in.	=	
,, ,,	Goole	2·38 in.	=	8·5 per cent.
,, ,,	Malton	2·33 in.	=	8·3 ,, ,,
,, ,,	Whitby, Hawsker.....	2·08 in.	=	
,, ,,	,, N. Lighthouse ...	2·05 in.	=	8·2 per cent.
,, ,,	Scarborough	2·01 in.	=	7·2 ,, ,,
,, ,,	Ganton Hall	2·00 in.	=	7·3 ,, ,,

The above table contains some of the most important returns, and the map shows the position of all stations at which the fall on this day was greater than on any other day throughout the year.

Although falls of 2 in. and upwards are confined to part of East Yorkshire, those of from 1 in. to 2 in. extend S.S.W. in a narrow track, crossing the counties of York, Nottingham, Stafford, Worcester, Hereford, Gloucester, Somerset, and just reaching into Devon. The breadth of the track was pretty constant, varying from 40 to 50 miles, while its length, reckoning from the coast line at Whitby, was about 300. On either side, and beyond the S.S.W. end of the area indicated, the fall rapidly diminished, being seldom more than 0·1 or 0·2, except in the area above defined.

SEPTEMBER 20TH.

A heavy fall in the north-east of Scotland. Max. at XVII. Grantown 2·24 in. = 8·2 per cent.

SEPTEMBER 23RD.

The first day of one of the wettest weeks on record for some years past. The amount over England generally was about half-an-inch, but in Middlesex, South Essex, East Surrey, East Sussex, and most parts of Kent, it exceeded an inch. It exceeded 1½ in. at Erith and Beckenham, in Kent, at Croydon, at the two Dorking stations of West-street and Denbies, and at Glynde, in Sussex; the last three exceeding 1¾ in., and Glynde having 1·96 in. = 6·2 per cent.

SEPTEMBER 24TH.

It would almost appear that the fall of the 23rd occurred later in the northern counties of England, as several stations in Yorkshire and

adjoining counties had from half to three-quarters of an inch, while in other parts of the country there was scarcely any.

SEPTEMBER 25TH.

A heavy fall in South Devon, as shown in the following table; more than an inch at detached stations in the South Midland counties and in Wales, and an average of about half-an-inch over the whole of England and Wales, south of latitude 52°.

Fore Street, Kingsbridge	3·00 in.	= 6·9	per cent.
Dart View, Totness	1·91 ,,	= 4·0	,,
Lupton, Brixham	1·82 ,,	= 4·1	,,
Lamorna, Torquay	1·39 ,,	= 3·8	,,

SEPTEMBER 26TH.

The fall in England and Wales on this day ranged from 0·10 to 1·00 in., and averaged about half-an-inch. The special feature of this day's rain was the fall in the south of Ireland.

Glenam, Clonmel..... .	2·18 in.	= 4·7	per cent.
Curraghmore, Waterford ...	2·16 in.	= 3·8	,,
Bruce Villa, Clonmel	1·91 in.	= 4·6	,,
Queen's College, Cork.....	1·89 in.	= 4·2	,,
Glenville, Fermoy	1·57 in.	= 2·9	,,
Courtown	1·31 in.	= 3·8	,,

SEPTEMBER 27TH.

Between half and three-quarters of an inch of rain fell at most English stations, and considerably more at stations north of Doncaster and south of Carlisle, and also at some stations in Gloucestershire, Shropshire, and Wales. The following are some of the largest amounts and per-centages.

Hurworth Burn, Hartlepool..	2·70 in.	= 7·8	per cent.
Eccup, Leeds	2·15 in.	= 7·2	,,
Burford House, Tenbury ...	2·12 in.	= 6·8	,,
Scissett, Huddersfield.....	2·03 in.	= 8·1	,,
Queensbury, Bradford.....	2·03 in.	= 5·9	,,
Heaton, Bolton	1·91 in.	= 4·6	,,
Bootham, York	1·90 in.	= 6·6	,,

SEPTEMBER 28TH.

The fall on this day was very slight, seldom exceeding one-tenth of an inch.

SEPTEMBER 29TH.

The most important rainfall of the year occurred upon this day, being a heavy fall, averaging rather more than $1\frac{1}{4}$ in. over the larger

RAINFALL OF SEPTEMBER 29TH, 1871.

6°	Penzance. 5°	Plymouth. 4°	Exeter. 3°	Bath. 2°	Oxford. 1°	Bedford. 0°	Wisbeach. 1°	The N. Sea. 2°	
·61	...	...	...	·35	·58	·90	...	...	54°
1·21	...	·32	1·06	1·09	1·65	1·70	1·45	...	53° 30′ The N. Sea.
1·30	...	·40	·82	1·63	1·55	1·50	1·47	1·73	53° Wisbeach.
1·46	...	1·16	1·22	1·62	1·66	1·54	1·35	1·70	52° 30′ Bedford.
1·48	..	1·65	1·35	1·64	1·44	1·34	1·38	1·53	52° Oxford
1·04	...	1·17	1·36	1·25	·88	1·00	1·12	·50	51° 30′ Bath.
·94	...	1·37	1·30	1·05	·61	·73	·57	...	51° Exeter.
1·37	1·60	1·55	·95	..	...	..	...	...	50° 30′ Plymouth.
									50°
(1·22)	1·60	1·09	1·15	1·23	1·19	1·24	1·22	1·36	

The above may be regarded as a skeleton map of Wales, and England as far north as York, on Mercator's projection, and with the coast-line omitted, so as to render the sequence of the numbers as prominent as possible. The dividing lines are all figured, being degrees of longitude and half degrees of latitude, and a principal town in each line of squares is given, as a further means of identification.

The spaces are, of course, not equal in area, but may approximately be taken as 45 miles from east to west, and 35 miles from north to south.

The underlined figures at the end of each column show the average fall in the latitude or longitude to which they are opposite.

part of England and Wales. The area over which it was not only heavy, but the heaviest fall in the year is indicated in the following map.

The number of stations (183) is so great that we have averaged them, and therefrom constructed the accompanying diagram, and instead of printing them all we have selected (1) the instances in which the fall exceeded 1·75 in., or (2) in which the per-centage equivalent exceeded seven per cent.

Div.	Station.	Depth.	Per cent.	Div.	Station.	Depth.	Per cent.
III.	Easton-on-the-Hill...	1·77	7·8	IV.	Burnham	1·71	8·0
,,	Conington Castle ...	1·78	8·1	,,	Holkham.....	1·64	7·8
,,	Stotfold	1·88	9·4	V.	Carclew	1·80	3·7
,,	Cardington	1·48	7·6	,,	Callington Church St	1·89	3·5
,,	Granchester Mill ...	1·51	7·4	VI.	Dudmaston	1·96	7·3
,,	Beech House	1·40	7·3	,,	Orleton	2·02	6·5
,,	Merton Villa	1·47	7·4	,,	Leamington.....	1·71	7·3
,,	Cambridge Obs.	1·51	7·9	,,	Birmingham Bot. G..	1·97	7·1
IV.	Clement's Hall	1·70	8·2	VII.	Thornton.....	1·78	6·8
,,	Birch Hall	1·66	7·6	,,	Wytham-on-Hill.....	1·43	7·5
,,	Walsham-le-Willows	1·72	7·0	,,	Stubton	1·81	7·5
,,	Somerleyton Hall ...	1·86	8·7	,,	Navenby	1·88	7·5
,,	,, Rectory	2·10	9·0	,,	Welbeck	1·78	7·0
,,	Dickleburgh	1·60	7·3	,,	Stony Middleton.....	1·91	5·5
,,	Geldeston	2·06	9·3	VIII.	Swineshaw	1·80	4·0
,,	Norwich	1·90	7·5	IX.	Llanfrechfa	2·21	4·9
,,	,, Thorpe ..	1·99	7·6	,,	Cwmbran.....	2·01	4·0
,,	Egmere	1·84	7·5	,,	Haverfordwest	2·54	5·4

The general distribution of this fall has, in one respect, a resemblance to that of September 6th, the large per-centages being again on the east coast, but in the neighbourhood of Lowestoft instead of Scarborough. With this feature the resemblance ceases, for while the

heavy fall on September 6th was over a long narrow band of country, that of September 29th extended over two-thirds of England and Wales.

SEPTEMBER 30TH.

The fall on this day was generally slight, but adding, as it did, about half-an-inch to the falls of the previous days it should not pass unnoticed.

OCTOBER 1ST.

Rain was pretty general on this day, but amounted usually to less than half-an-inch; the exceptions were in Forfarshire and Aberdeenshire, as shown below :—

Barry Village	1·84 in.	=	5·4 per cent.
Ballater	1·87 in.	=	7·0 ,,
Bogside	1·91 in.	=	6·5 ,,
Seafield Cottage	1·47 in.	=	5·1 ,,
Blackstock	1·93 in.	=	6·9 ,,

OCTOBER 6TH.

The wettest day in the year in North Wales, but the amounts by no means large. Maximum at Llanfairfechan, 2·60 in. = 7·7 per cent.

NOVEMBER 20TH.

Rather a heavy fall in the south of Ireland and in the Hebrides. Maximum at Portree, 2·73 in. = 3·4 per cent.

MAXIMUM FALLS IN 1871.

In accordance with our usual custom we have now to consider the relation which the falls already described, and some hundreds of others, bear to the annual totals at the respective stations, and to the maximum falls in previous years.

Year.	Number of Returns.	Mean Per-centage.	Mean Amount.	Mean Total Fall in year.	1867 being assumed =100.	Ratio of Rainfall to the Mean.	Total Fall being assumed =34 in. Mean Max. =
1865	481	5·1	1·70 in.	33 in.	106	102	5·00 per cent.
1866	590	3·7	1·48 ,,	40 ,,	129	119	4·36 ,,
1867	584	4·6	1·44 ,,	31 ,,	100	100	4·24 ,,
1868	676	4·3	1·43 ,,	33 ,,	106	106	4·21 ,,
1869	637	4·2	1·42 ,,	34 ,,	108	101	4·18 ,,
1870	687	4·9	1·30 ,,	27 ,,	81	82	3·82 ,,
1871	752	4·9	1·49 ,,	30 ,,	98	97	4·38 ,,

From the second column we find that the number of returns discussed for this purpose is again larger than in any previous year, the numbers having risen from 481 in 1865 to 752 in the present year.

The third shows that the mean per-centage is precisely the same as in 1870, and about 0·4 per cent. above the mean.

The fourth shows that the average maximum fall was nearly the same as in previous years.

The fifth shows (as from the evidence of the two previous columns it should do) that the mean total yearly fall at the stations whose returns were under discussion, was about eight per cent. less than in the previous years. This, of course, may arise from either of two causes (1) the stations contributing the data this year being in drier districts than those contributing in previous years, or (2) the stations being similar in both cases, the total fall in 1871 being below the average.

The sixth column shows the same feature in a modified form available for comparison with the next column.

The figures in the seventh column are obtained from the table on page 155, and being in close accordance with those in the previous column, show the delicate check values obtained by this somewhat

intricate process, and also indicate that the increased number of returns have been obtained from fairly distributed localities.

The last column shows the relation of the mean observed maximum falls to a constant value, thereby affording an exact index of their fluctuation in per-centage terms, just as column four gives it in actual depth, and it of course tells the same tale; it shows that the maximum falls have been the same as in previous years within less than one-tenth per cent.

ABSTRACT OF MAXIMUM FALLS IN 1871.

Largest Falls.

Date.	Div.	Stations.	Depth.	Per cent.	Fall in year.
August 14..	V.	Melbury	4·24 in.	9·8	43·52 in.
Dec. 18 ...	X.	Seathwaite	3·88 ,,	3·4	115·15 ,,
Sept. 6... ..	IX.	Warter	3·62 ,,	11·5	31·53 ,,
Dec. 25 ...	X.	Patterdale Hall	3·20 ,,	4·2	76·39 ,,
August 18..	X.	Underfell	3·19 ,,	6·5	49·28 ,,
Nov. 19 ...	XV.	Ballachulish	3·02 ,,	3·6	83·59 ,,
,,	V.	Fore Street, Kingsbridge	3·00 ,,	7·0	43·30 ,,
Aug. 20 ...	X.	Low Nook, Ambleside	2·95 ,,	4·1	71·54 ,,
,, 18 ...	X.	Kent Terrace, Kendal	2·88 ,,	5·7	50·25 ,,
Nov. 19 ...	XXII.	Woodstock	2·84 ,,	6·1	46·25 ,,
Aug. 20 ...	X.	Ambleside Nurseries	2·82 ,,	4·0	70·35 ,,
,, 18 ...	XIV.	Bothwell Castle	2·81 ,,	10·0	28·22 ,,
,, 20 ...	X.	Middle Fairbank	2·75 ,,	4·6	59·24 ,,
Nov. 20 ...	XVIII.	Portree	2·73 ,,	3·4	79·19 ,,
Oct. 6	XI.	Rhiw-bryfdir	2·69 ,,	3·4	79·94 ,,
Jan. 1	XV.	Glenborrodale	2·60 ,,	4·5	58·30 ,,

Largest Per-centages.

Date.	Div.	Stations.	Per cent.	Depth.	Fall in year.
Sept. 6.....	IX.	Warter	11·5	3·62 in.	31·53 in.
Aug. 18 ...	XIV.	Bothwell Castle	10·0	2·81 ,,	28·22 ,,
,, 14 ...	V.	Melbury	9·8	4·24 ,,	43·52 ,,
June 17 ...	III.	Sandy	9·5	2·07 ,,	21·75 ,,
Sept. 29 ...	,,	Stotfold	9·4	1·88 ,,	19·88 ,,
,, ,, ...	IV.	Geldeston	9·3	2·06 ,,	22·18 ,,
,, ,, ...	,,	Somerleyton Rectory	9·0	2·10 ,,	23·44 ,,
,, ,, ...	,,	,, Hall	8·7	1·86 ,,	21·47 ,,
June 15 ...	VIII.	Belmont	8·6	2·58 ,,	30·21 ,,
Aug. 13 ...	VII.	Studley	8·5	2·55 ,,	30·03 ,,
Sept. 6 ...	IX.	Goole	8·5	2·38 ,,	27·80 ,,
,, ,, ...	,,	Malton	8·4	2·33 ,,	27·76 ,,
,, ,, ...	,,	Whitby North Lighthouse	8·3	2·05 ,,	24·73 ,,
,, 20 ...	XVII.	Grantown	8·2	2·24 ,,	27·27 ,,
July 9 ...	II.	Otterbourne	8·1	2·38 ,,	29·34 ,,
June 17 ..	III.	Stretham	8·1	1·65 ,,	20·33 ,,

The following tables are similar in construction to those given in

previous volumes, and it is hoped require no explanation. It will be seen that the comparatively dry station of Melbury heads the list of largest falls, and is only third in the list of per-centages. This is due to the very heavy thunderstorm on August 14th, described on page 99. The following synopsis of the abstracts for this and previous years enables us to compare the extremes of 1871 with other years.

Largest Falls.

	MEAN.				ABSOLUTE.			
Years.	Depth.	Per Cent.	Mean total fall at these stations.		Depth.	Per cent.	Station.	Division.
			Computed.	Observed.				
	in.		in.	in.	in.			
1864 ...	3·47	6·3	55·1	...	6·47	5	Seathwaite	X.
1865 ...	3·67	6·4	57·3	61·8	6·41	5	Seathwaite.....	X.
1866 ...	3·40	4·4	77·3	86·2	6·38	4	Seathwaite.....	X.
1867 ...	3·17	9·0	35·2	42·5	4·78	16	Hartlip	II.
1868 ...	3·32	6·1	54·3	65·9	5·60	5	Camusinas.....	XV.
1869 ...	3·68	5·0	73·6	77·7	6·70	4	Seathwaite.....	X.
1870 ...	3·20	7·5	42·7	43·8	6·00	17	Tongue	XIX.
1871 ...	3·08	5·7	54·2	61·6	4·24	10	Melbury.....	X.
Mean ...	3·37	6·3	56·2	..	5·82	8·3	.....	...

Largest Per-Centages.

	MEAN.				ABSOLUTE.			
Years.	Per Cent.	Depth.	Mean total fall at these stations.		Per cent.	Depth.	Station.	Division.
			Computed.	Observed,				
		in.	in.	in.		in.		
1864 ...	9·0	2·48	27·6	...	13·2	3·10	W. Retford ...	VII.
1865 ...	9·9	2·62	26·5	28·4	13·0	4·40	Fleckney	VII.
1866 ...	8·1	2·31	28·5	29·3	10·0	2·48	Burton	VI.
1867 ...	11·0	2·85	25·9	25·3	16·0	4·78	Hartlip	II.
1868 ...	8·6	2·55	29·7	30·1	11·0	4·00	Tongue	XIX.
1869 ...	7·9	2·17	27·5	27·9	10·0	3·40	Tillydesk	XVII.
1870 ...	10·0	2·34	23·4	22·9	17·1	6·00	Tongue	XIX.
1871 ...	9·0	2·43	27·0	26·8	11·5	3·62	Warter	IX.
Mean...	9·2	2·47	27·0	...	12·7	3·97	.....	...

These tables, based only upon the extreme records, indicate similar features of distribution to those which are afforded by the first table, based upon the whole of the 752 returns. It is unnecessary to repeat what we have already stated, and the tables are themselves the best commentary on the facts.

HEAVY FALLS OF SHORT DURATION.

THE following table contains several very remarkable falls, and although in its present form more complete than anything hitherto published, is we are sure, capable of yielding very much more important information than at first sight appears. We shall be glad if in future we can devote more time to its elaboration, but it has taken much to collect the data, and it must go forth in its present form.

Date.	Division.	Station.	Duration.		Amount.	Rate per hour.
1871.			hr.	min.	in.	inches.
January 16.	II.	Forest Hill	...	35	·22	0·38
April 19 ...	X.	Casterton	...	11	·40	2·18
May 8.....	II.	Belfield, Croydon	...	22	·52	1·42
,, 25.....	X.	Casterton	1	30	·68	·45
,, 26.....	X.	Gainford	...	30	·50	1·00
June 14 ...	II.	Brighton	...	1	·10	6·00
,, 14 ...	II.	,,	...	12	·52	2·60
,, 14 ...	III.	Thorpelands	1	...	1·25	1·25
,, 14 ...	VII.	Belmont Villas	4	...	1·54	·38
,, 14 ...	VII.	Trent College	2	...	1·27	·64
,, 14 ...	VII.	Swanwick	...	12	·55	2·75
,, 17 ...	I.	Winchmore Hill	...	30	·47	·94
,, 18 ...	XIV.	Cumnock	...	45	·90	1·20
,, 19 ...	I.	Camden Square	...	15	·40	1·60
July 3.....	XXI.	Fitzwilliam Square	...	20	·18	·54
,, 8.....	XXII.	Ballinasloe	...	8	·30	2·25
,, 9.....	V.	Chalbury	...	5	·18	2·16
,, 9.....	IX.	Middlesborough	...	20	·20	·60
,, 14.....	IX.	Otterburn	2	...	1·23	·62
,, 22.....	XVIII.	Strathconan	1	...	·53	·53
,, 25.....	II.	Lymington	...	20	·20	·60
,, 29.....	V.	Lacock, Chippenham	...	8	·16	1·20
Aug. 13 ...	II.	Ashbury Vicarage	2	..	1·89	·95
,, 13 ...	V.	Sunnyside, Trowbridge	1	...	1·53	1·53
,, 13 ...	V.	Lacock, Chippenham	...	15	·60	2·40
,, 13 ...	VI.	Sambourne, Warwick	1	10	1·81	1·56
,, 13 ...	VI.	Studley, Redditch	2	10	2·55	1·18
,, 14 ...	V.	Melbury, Dorset	4	...	4·24	1·06
,, 14 ...	V.	Bincombe Ho., Crewkerne	...	30	·60	1·20
,, 16 ...	V.	Jacobstowe	1	...?	1·26	1·26
,, 16 ...	V.	South Molton	1	5	1·41	1·30
,, 17 ...	V.	Ham	2	...	·90	·45
,, 17 ...	VII.	Branston Hall	...	30	·50	1·00
,, 17 ...	VII.	Long Hills, Lincoln	...	30	·95	1·90
,, 18 ...	IV.	Diss	...	12	·33	1·65
,, 18 ...	X.	Underfell, Kendal	3	...	3·05	1·02
,, 18 ...	X.	Burton, Westmoreland	...	45	1·45	1·93
,, 18 ...	XIV.	Bothwell Castle	1	10?	2·00	1·72
,, 26 ...	X.	Casterton	...	8	·47	3·53
Sept. 6.....	IX.	Warter, Pocklington	5	...	3·62	·72
,, 6.....	IX.	,, ,,	3	...	3·00	1·00
,, 24.....	II.	Uckfield Observatory	...	5	·55	6·60

ON THE MONTHLY FALL OF RAIN IN THE BRITISH ISLES DURING 1871.

It has been suggested by various persons both in this country and on the continent, that the information in our previous publications respecting *monthly* rainfall was less complete than other parts of our work. Although we do not concur in the opinion, we cheerfully defer to that of very able judges, and, in spite of the cost of so much tabular matter, have increased this portion of the work more than three-fold, and in the following pages give the monthly returns from more than one hundred stations—as a rule, one in each county in the three kingdoms. The exceptions are, that a few of the larger counties have more than one representative, and that twelve counties have none, viz., Anglesea, and the following Irish counties, in which, with the exceptions noted, there are no observations made :—

Clare (only station Killaloe ; observations already published in *Meteorological Magazine.*)
Fermanagh (only one station, and its returns not to hand.)
Kildare, Leitrim, Limerick, Longford, Louth, Mayo, Meath (East), Monaghan — No returns from any of these counties ; they would be very acceptable.
Roscommon (return not yet received from the only station in the county.)

It may be well to explain the grounds on which the following stations have been selected (1) Geographical position ; (2) Fairly representative character of the station (*e.g.*, the Stye would not be a fair type of Cumberland rainfall, nor would Penrith, the former would be too large and the latter too small); (3) Uniform height of gauge above ground ; (4) Moderate elevation above sea level ; (5) Known or presumed accuracy of gauge and observer ; (6) Insertion in previous tables ; which facilitates comparison with former years.

Even with our unequalled staff of correspondents it has been impossible to meet all these requirements, but the selection has been made with great care, and, as we shall presently show, is evidently very trustworthy.

In order to keep all our general remarks on this subject together, we will notice one other point before proceeding to the examination of each separate month. We have already intimated that in our own opinion (which we readily waive) the monthly values were given in sufficient detail in previous volumes. Let us first recall what was given last year—(1) the tables corresponding to those following this article contained the monthly fall at thirty-six stations; (2) the various reports of experimental work gave several more, making a total of nearly fifty.* We believe that the principal use of monthly totals is for the determination of the character of seasons, which implies groups of not less than three months. Now, on examining the table of per-centages (the simplest mode of comparing the relative intensity of monthly rainfall), it will be found that adjacent counties and even districts often run very close together, therefore it seems to us, that on the principle *ex uno disce omnes*, a few typical stations convey as much information as a great many, although to some it may seem that the larger number render assurance doubly sure.

In the next place, we wish to say a few words as to the per-centage tables and their use; it is surely unnecessary to explain the very simple manner in which they are formed. Take the first for an illustration: from page 139 it appears that the total fall at Camden Square in the year was 25·02, and in January 1·99, then

As 25·02 : 1·99 :: 100 : 7·95

or the January fall was 7·95 (or 8) per cent. of the yearly total, which will, therefore, be found so entered on page 145.

But we wish to point out the reverse application of this method, which will enable observers whose returns are not among the selected ones to see how far theirs agree with those of their neighbours. It is evident that if the total is 25·02, one per cent. of that is ·25, that is to say one per cent. of any total is obtained by shifting the decimal point two places to the left. This extremely simple fact being remembered, everything else is quite plain, but to make it absolutely unmistakable we will give a completely worked out example. The observer who desires to compare his return must either take from the per-centage table that given for his own county, or if he desires to be still more accurate, the mean of his own and adjacent counties, and multiply his yearly total (having shifted the decimal as above-mentioned) by this per-centage. Now, for the example, we will select Strathfield Turgiss, and

* Fifty others are also given in the *Meteorological Magazine*.

ascertain if the monthly distribution of rain at that station was similar to that at other stations in the vicinity. The following is the process *in extenso* :—

	Total Rainfall at Strathfield Turgiss in year 22·11, with decimal shifted.		Per-centage for Hampshire from p. 145.		Computed Rainfall at Strathfield Turgiss.		Observed Rainfall at Strathfield Turgiss.		Difference. Amount.	Per-cent.
Jan.	·2211	×	11	=	2·43	...	1·81	...	— ·62	= 3
Feb.	·2211	×	6	=	1·33	...	·95	...	— ·38	= 2
March.	·2211	×	6	=	1·33	...	1·12	...	— ·21	= 1
April	·2211	×	16	=	3·54	...	3·42	...	— ·12	= 0·5
May	·2211	×	1	=	·22	...	·25	...	+ ·03	= 0
June	·2211	×	13	=	2·87	...	2·99	...	+ ·12	= 0·5
July	·2211	×	10	=	2·21	...	3·69	...	+1·48	= 7
August	·2211	×	5	=	1·10	...	·87	...	— ·23	= 1
Sept.	·2211	×	16	=	3·54	...	4·20	...	+ ·66	= 3
Oct.	·2211	×	6	=	1·33	...	1·22	...	— ·11	= 0·5
Nov.	·2211	×	4	=	·88	...	·37	...	— ·51	= 2
Dec.	·2211	×	6	=	1·33	...	1·22	...	— ·11	= 0·5

This hap-hazard specimen is, on the whole, not unsatisfactory; the difference between the observed and computed fall only reaching half-an-inch in four months, and the wide discrepancy in July being evidently due to the fall of 1·57 on the 10th of that month.

But Strathfield is on the northern edge of the county, joining Berkshire, and the type station for Hampshire (so as to provide for the Isle of Wight) is near the southern limit, it is, therefore, probable that the fall at Strathfield will be more accurately obtained by using the mean of the per-centages of Hampshire and Berkshire. The following would, therefore, be the process :—

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Hampshire.	11	6	6	16	1	13	10	5	16	6	4	6
Berkshire...	9	5	6	13	2	10	17	4	18	6	2	8
Mean	10	5·5	6	14·5	1·5	11·5	13·5	4·5	17	6	3	7

and using these mean values we should have

	Total Rainfall at Strathfield Turgiss in year 22·11, with decimal shifted.		Mean Per-centage Hants and Berks.		Computed Rainfall at Strathfield Turgiss.		Observed Rainfall at Strathfield Turgiss.		Difference. Amount.	Per-cent.
Jan.	·2211	×	10	=	2·21	...	1·81	...	— ·40	= —2
Feb.	·2211	×	5·5	=	1·22	...	·95	...	— ·27	= —1
March.	·2211	×	6	=	1·33	...	1·12	...	— ·21	= —1
April	·2211	×	14·5	=	3·21	...	3·42	...	+ ·21	= +1
May	·2211	×	1·5	=	·33	...	·25	...	— ·08	= —0·5
June	·2211	×	11·5	=	2·54	...	2·99	...	+ ·45	= +2
July	·2211	×	13·5	=	2·98	...	3·69	...	+ ·71	= +3
August.	·2211	×	4·5	=	·99	...	·87	...	— ·12	= —0·5
Sept.	·2211	×	17	=	3·76	...	4·20	...	+ ·44	= +2
Oct.	·2211	×	6	=	1·33	...	1·22	...	— ·11	= —0·5
Nov.	·2211	×	3	=	·66	...	·37	...	— ·29	= —1
Dec.	·2211	×	7	=	1·55	...	1·22	...	— ·33	= —1·5

This shows a closer agreement, the sums of the differences, irrespective of sign, being reduced from 4·58 to 3·62. On looking closely into the two tables we shall find that the principal reason for this decrease is the fact that the July storm extended to the Berkshire type station. And thus we are driven back to our original argument respecting the sufficiency (for most purposes) of a less number of monthly returns, for it will be found that when Hampshire alone was used, seven months out of twelve agreed within one per cent., and when the extra station of Welford (Berks) is worked in, the number remains exactly the same, the only improvement being in the summer months, during which (owing to thunder-storms) the fall of rain is so much more irregular, that we doubt if any moderate number of stations would materially improve the agreement of the results. We do not think that anything closer is at all required, and we believe that the illustration, which we selected without previous examination, shows that the tables are now competent to furnish all the particulars which can reasonably be required.

Having offered these introductory remarks upon the construction and mode of using the tables, we now insert them without further preface, feeling that it is more appropriate that they should precede than follow the statement of the conclusions to which they appear to lead.

MONTHLY RAINFALL IN 1871.

ENGLAND.

Division ..	I.	II.					III.			
County ..	Middlesex.	Surrey.	Kent.	Sussex.	Hants.	Berks.	Herts.	Bucks.	Oxford.	North-ampton.
Station ..	Camden Square.	Cobham.	Hythe.	Forest L. Maresfield.	Leigh Park	Welford.	Bayford-bury.	Missenden.	Rad. Obser-vatory.	Welling-borough.
Ft. abv. Sea	111	65	12	259	120	335	250	...	207	...
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	1·99	2·54	3·13	3·48	3·40	2·48	1·26	1·80	1·11	1·01
Feb. ..	1·27	·98	2·23	3·13	1·78	1·22	1·62	1·69	·97	1·25
March..	1·19	1·49	1·84	1·58	1·90	1·53	1·76	1·50	·95	1·31
April ...	2·84	3·04	4·03	3·93	4·79	3·41	2·84	3·29	2·61	2·45
May ..	·92	·69	1·03	— ·69	— ·36	— ·42	— ·66	— ·67	— ·43	·54
June ...	3·49	3·07	3·15	4·15	3·99	2·79	2·63	3·45	3·17	3·17
July ...	4·12	3·43	2·92	2·72	3·10	4·73	3·44	3·17	3·78	+3·80
August.	·85	·83	— ·84	1·42	1·43	1·00	·94	·92	·51	— ·51
Sept. ...	+5·28	+4·72	+4·66	+4·47	+4·87	+5·04	+5·19	+5·05	+4·66	3·47
October.	1·34	1·05	1·77	2·18	1·75	1·61	·87	1·99	1·19	·97
Nov. ...	— ·60	— ·41	2·01	·72	1·10	·43	·91	·88	·70	·81
Dec. ...	1·13	1·35	2·83	1·98	1·82	2·07	1·30	1·50	1·06	·88
Totals..	25·02	23·60	30·44	30·45	30·29	26·73	23·42	25·91	21·14	20·17

Division ..	III.			IV.			V.			
County. ..	Hunts.	Bedford.	Cambridge.	Essex.	Suffolk.	Norfolk.	Wilts.	Dorset.	Devon.	Cornwall.
Station ..	Wistow.	Bedford.	Wisbech.	Chelmsford	Yaxley.	Swaffham.	Alderbury.	Dorchester.	Bovey Tracey.	St. Austell.
Ft. abv. Sea	...	85	10	...	199	239	250 ?	250	92	300
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	·88	·86	·87	1·54	1·12	— ·63	2·91	3·99	4·14	6·41
Feb. ...	1·42	1·01	2·07	1·25	1·96	2·07	1·42	2·04	3·38	2·88
March..	1·15	1·20	1·15	1·17	1·08	1·27	1·36	2·58	2·31	1·74
April ...	2·64	1·94	3·07	2·20	3·20	3·34	3·95	+5·86	5·83	4·50
May ...	·96	1·03	— ·74	1·06	— ·76	1·17	·49	—1·15	— ·23	— ·27
June ...	3·41	3·40	+4·11	2·51	3·04	2·68	2·25	3·17	1·74	2·72
July ...	3·56	2·97	3·52	2·72	2·40	2·83	4·34	4·11	4·25	5·93
August.	·46	·60	1·35	1·33	1·34	— ·63	1·24	1·91	1·34	3·62
Sept.....	+3·74	+4·80	3·92	+4·35	+3·67	+3·99	+4·53	5·60	+7·22	+7·69
October	1·26	·76	1·35	1·47	·91	1·65	2·42	5·09	5·52	5·43
Nov. ...	1·10	·92	1·39	— ·70	1·75	2·05	— ·45	2·02	1·32	2·61
Dec. ...	— ·45	— ·45	1·28	1·11	1·31	1·32	2·26	2·97	3·69	3·86
Totals..	21·03	19·94	24·82	21·41	22·54	23·63	27·62	40·49	40·97	47·66

MONTHLY RAINFALL IN 1871—(*continued.*)

ENGLAND—(*continued.*)

Division ..	V.	VI.						VII.		
County....	Somerset.	Glos'ter.	Hereford.	Salop.	Stafford.	Worcester.	Warwick.	Leicester.	Rutland.	Lincoln.
Station ..	Ilminster.	Nailsworth	Stretton.	Woolstaston.	Barlaston.	Hagley.	Leamington.	Loughboro'	Thistleton.	Miningsley
Ft. abv. Sea	131	160 ?	198	790	530	636	195	400 ?	...	135
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	3·35	1·52	2·53	2·77	1·73	1·82	·85	— ·85	— ·80	·61
Feb. ...	1·93	1·97	1·35	1·66	3·09	1·72	1·00	1·24	1·27	1·57
March..	1·96	1·91	1·28	1·42	1·30	1·05	1·10	1·28	·99	— ·52
April ...	3·95	4·26	2·12	3·22	3·52	2·60	3·07	3·32	2·51	3·14
May ...	— ·66	1·47	— ·95	1·20	1·82	1·63	1·22	1·91	1·35	1·19
June ...	1·34	3·03	3·72	3·61	2·98	4·11	2·55	5·12	3·29	3·03
July ...	3·22	4·76	3·14	4·50	4·26	4·32	4·23	5·08	+5·40	2·74
August.	1·90	1·83	1·77	1·81	3·11	·84	— ·60	1·09	1·19	·97
Sept. ...	+5·36	+5·83	+6·43	+5·34	+4·84	+6·22	+5·57	+5·67	3·79	+3·75
October	4·15	2·23	3·40	4·96	4·40	2·67	1·19	1·48	1·31	1·56
Nov. ...	1·17	— ·75	— ·95	—1·05	—1·20	— ·66	·75	1·14	1·35	1·48
Dec. ...	3·49	2·74	1·53	1·75	1·62	1·83	1·18	1·18	1·07	1·79
Totals..	32·48	32·30	29·17	33·29	33·87	29·47	23·31	29·36	24·32	22·35

Division ..	VII.		VIII.		IX.			X.		
County....	Notts.	Derby.	Cheshire.	Lancashire.	Yorks. W.R.	Yorks. E.R.	Yorks. N.R.	Durham.	Northumberland.	Cumberland.
Station ..	Southwell.	Bamford.	Chelford.	Preston.	Leeds.	Warter.	Northallerton.	Ushaw.	Unthank Hall.	Mirehouse.
Ft. abv. Sea	200 ?	500 ?	260	73	95	230	133	600	380	310
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	·49	—1·24	—1·13	1·50	·86	— ·80	— ·70	1·17	2·33	4·56
Feb. ...	1·14	1·65	2·81	3·20	2·00	2·44	2·02	1·78	2·17	3·89
March..	·64	2·31	1·20	2·00	·80	1·20	·98	— ·93	1·63	3·57
April ...	2·68	3·29	2·91	2·40	3·19	3·52	1·95	3·12	3·45	2·29
May ...	·87	2·04	1·55	1·70	·97	1·69	1·62	1·89	—1·27	—1·21
June ...	2·51	4·55	4·55	2·25	3·42	2·95	4·34	3·41	2·27	1·63
July ...	2·93	2·27	+5·44	4·80	2·71	4·17	4·72	3·35	+4·63	2·82
August.	— ·38	1·84	1·73	2·00	·98	·94	·76	1·49	2·34	4·81
Sept. ...	+4·05	+5·71	4·45	2·90	+5·73	+7·81	+5·08	+5·03	4·40	2·81
October	1·43	2·82	4·44	+6·90	2·74	1·80	2·19	2·35	2·78	3·65
Nov. ...	·96	2·91	1·65	—1·40	— ·68	1·95	·94	1·56	1·81	2·22
Dec. ...	·94	3·68	2·10	3·20	1·17	2·26	2·04	1·80	3·93	+6·66
Totals..	19·02	34·31	33·96	34·25	25·25	31·53	27·34	27·88	33·01	40·12

MONTHLY RAINFALL IN 1871—(*continued.*)

ENGLAND (*continued*). WALES.

Division ..	X.	XI.								
County....	Westmore-land.	Monmouth	Glamorgan	Carmar-then,	Pembroke.	Cardigan.	Brecon.	Radnor.	Mont-gomery.	Flint
Station....	Kendal.	Dingestow.	Pentyrch	Asylum.	Milford.	Aberyst-with.	Watton Mount.	Heyhope.	Carno.	St. Asaph
Ft. abv. sea	146	300 ?	100	185	130	42	450	690	550	280
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	2·85	2·37	3·73	4·94	6·36	3·95	4·11	4·36	3·60	1·20
Feb. ...	5·04	2·13	3·40	4·04	2·71	2·47	2·72	2·30	2·40	1·79
March..	2·66	1·59	2·55	3·13	1·60	2·13	3·14	2·22	2·90	1·13
April ...	3·26	2·27	7·30	4·91	3·93	3·12	4·41	4·47	4·30	1·98
May ...	1·83	1·11	— ·51	— ·92	— ·37	— ·75	— ·62	— ·92	—1·20	1·53
June ...	1·98	2·33	2·10	2·85	1·50	2·74	2·70	2·94	2·80	2·88
July ...	+7·67	4·62	+7·35	+7·29	4·04	+5·50	4·19	5·04	5·50	3·68
August.	6·99	1·89	3·78	3·21	2·61	2·96	3·47	1·49	2·90	—1·01
Sept. ...	3·94	+7·30	6·81	5·98	+7·65	2·76	4·62	5·73	+5·70	+4·65
Oct. ..	6·65	3·57	5·30	7·04	6·08	5·11	+6·95	+5·86	4·80	4·29
Nov. ...	—1·56	— ·69	1·49	1·89	1·50	3·01	·70	1·23	1·80	2·00
Dec. ...	5·82	2·62	3·10	5·16	4·13	2·26	3·66	2·15	2·40	1·82
Totals..	50·25	32·49	47·42	51·36	42·48	36·76	41·29	38·71	40·30	27·96

WALES (*continued*). SCOTLAND.

Division ..	XI.			XII.				XIII.		
County....	Denbigh	Merioneth	Carnarvon	Wigton	Kirkcud-bright	Dumfries	Roxburgh	Selkirk	Peebles	Berwick
Station....	Rosset	Dolgelly	Port Madoc	N. Balfern	Dalbeattie	Kirk-patrick	New Castleton	Galashiels	Glenrath	Dunse
Ft. abv. sea	58	43	10	75	25 ?	346	400	416	764	267
	in.	in.	in.	in.	in.	in.	in.	in	in.	in.
January	1·71	5·50	4·02	4·02	4·72	5·80	3·10	1·89	4·02	1·14
Feb. ...	1·90	7·23	3·44	+8·37	4·75	7·15	5·70	+3·43	3·38	3·00
March..	1·44	3·80	2·58	2·98	3·29	4·75	2·50	1·91	3·76	— ·80
April ...	1·78	5·40	3·29	3·67	4·40	3·80	4·70	4·23	3·35	+3·60
May ...	1·84	2·25	— ·88	— ·83	— ·85	1·20	—1·00	— ·92	— ·93	1·74
June ...	2·55	—1·87	1·42	2·55	1·80	3·40	2·50	3·37	2·81	2·40
July ..	3·27	6·83	+6·98	3·08	4·70	5·50	+7·10	3·21	3·57	3·11
August.	1·44	2·79	2·33	3·74	3·65	3·80	1·70	1·86	2·33	1·91
Sept. ...	+4·80	5·19	2·82	1·77	2·59	—1·10	3·40	2·29	2·44	3·49
Oct. ...	3·81	+7·42	5·94	4·32	4·98	5·70	4·00	2·89	3·43	2·45
Nov. ...	—1·39	2·02	2·25	5·23	4·79	3·40	3·20	2·42	2·10	2·80
Dec.	1·53	5·73	4·50	5·00	+5·49	+8·50	6·70	2·46	+4·85	2·84
Totals..	27·46	56·03	40·45	45·56	46·01	54·10	45·60	30·88	36·97	29·28

MONTHLY RAINFALL IN 1871—(*continued.*)

SCOTLAND (*continued*).

Division ..	XIII.			XIV.			XV.			
County....	Haddington	Edinburgh	Linlithgow	Lanark	Ayr	Renfrew	Dumbarton	Stirling	Bute	Argyll (mainland)
Station....	East Linton	March Hall	Linlithgow	Baronald	New Cumnock	Newton Mearns	Arddarroch	Polmaise	Pladda	Airds
Ft. abv. sea	90	170	...	505	860	350	80	12	55 ?	15 ?
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	1·13	1·40	3·00	2·23	3·54	3·59	7·52	3·60	4·11	3·60
Feb. ..	3·26	2·70	3·10	2·19	4·90	5·05	7·93	+4·60	+6·76	5·40
March..	— ·38	1·10	1·89	2·79	4·85	4·90	6·67	2·80	1·92	5·40
April ...	+4·59	+4·60	+4·54	3·05	2·51	4·14	6·56	4·30	3·76	2·70
May ...	·85	—1·00	— ·81	— ·48	— ·95	—1·12	2·02	—1·30	— ·37	—1·20
June ...	3·22	2·40	1·47	2·42	2·41	1·95	—1·86	2·00	2·48	1·90
July ...	2·27	2·80	2·93	+4·94	4·28	4·40	6·23	4·10	3·35	5·00
August.	1·27	2·30	2·83	3·74	4·34	3·45	5·86	3·20	3·34	4·00
Sept. ...	2·43	2·60	2·66	1·97	3·66	2·08	2·38	2·50	2·71	1·80
Oct. ...	2·55	2·00	2·74	2·74	3·20	3·40	8·50	3·10	2·10	5·00
Nov. ...	3·22	3·40	2·19	2·44	2·50	4·06	6·45	2·60	2·46	5·70
Dec. ...	1·41	1·80	2·86	3·32	+6·39	+5·93	+9·42	4·00	3·82	+9·00
Totals ..	26·58	28·10	31·02	32·31	43·53	44·07	71·40	38·10	37·18	50·70

Division ..	XV.	XVI.					XVII.			
County....	Argyll (insular)	Clackmannan	Kinross	Fife.	Perth	Forfar	Kincardine	Aberdeen	Banff	Elgin
Station....	Islay	Dollar	Loch Leven	Cupar	Callander	Kettins	Brechin	Braemar	Gordon Castle	Elgin
Ft. abv. sea	67	174	...	130	345	218	235	1114	70	...
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	4·16	2·94	2·30	1·45	+8·50	2·74	1·80	— ·61	·66	— ·78
Feb. ...	+5·16	6·23	4·40	2·50	6·60	+4·92	4·70	3·62	1·54	1·51
March..	3·79	3·73	1·80	1·23	4·00	1·25	— ·70	2·73	— ·44	·80
April ...	3·95	+6·43	+5·30	+5·59	4·90	3·89	4·40	2·65	3·07	3·25
May ...	—1·13	—1·04	— ·80	— ·96	—1·20	— ·95	— ·70	1·06	·78	1·01
June ...	1·53	2·32	2·30	1·72	1·30	2·40	1·80	1·90	1·80	1·82
July ...	4·94	3·93	4·40	4·14	6·10	4·20	5·20	3·74	5·42	+5·34
August.	2·79	2·64	2·40	1·83	5·50	2·62	2·50	2·49	3·50	3·13
Sept. ...	3·91	2·74	2·20	1·69	1·80	2·25	2·00	3·72	+5·61	4·42
Oct. ...	5·13	2·94	4·20	3·10	5·60	4·31	+5·40	+4·51	1·75	1·37
Nov. ...	4·67	3·56	2·70	2·71	6·30	1·94	2·60	1·70	3·30	3·37
Dec. ...	4·36	3·49	1·30	1·12	7·80	2·15	1·40	1·62	·96	1·36
Totals ..	45·52	41·99	34·10	28·04	59·60	33·62	33·20	30·35	28·83	28·16

MONTHLY RAINFALL IN 1871—(*continued.*)

SCOTLAND (*continued*). IRELAND.

Division ..	XVII.	XVIII.				XIX.				XX.
County....	Nairn	W. Ross	E. Ross	Inverness (west)	Inverness (east)	Sutherland	Caithness	Orkney	Shetland	Cork,
Station....	Nairn	Duncraig	Alness	Loch Nevis	Farraline	Lairg	Wick	Holme Manse	E. Yell	Fermoy.
Ft. abv. sea	55	124	450	14	700	458	76	30?	178	114
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	·59	6·25	2·51	6·20	1·00	1·92	1·23	2·40	5·89	4·32
Feb. ...	·96	4·42	3·00	+10·60	1·40	4·50	2·21	2·78	+8·00	+4·55
March..	1·05	6·11	1·71	5·70	2·00	2·25	·89	2·40	3·57	2·28
April ..	2·10	2·34	4·09	2·30	1·60	3·69	1·67	2·12	2·98	3·19
May ..	— ·46	—1·37	— ·42	— 2·10	— ·40	2·17	— ·76	·90	2·09	— ·66
June ..	1·40	1·97	2·00	2·40	·50	—1·76	·89	— ·53	—1·98	3·10
July ...	4·57	4·87	+4·72	6·80	+6·30	+4·78	+3·34	2·90	2·34	3·80
August.	2·06	3·86	1·95	6·00	1·70	2·37	1·08	3·80	2·23	1·53
Sept. ...	+4·87	1·87	4·45	2·70	3·10	3·38	2·08	3·56	2·56	2·87
October.	1·27	7·21	3·78	6·50	2·40	4·02	1·73	2·05	6·47	3·82
Nov. ...	2·76	4·03	2·80	4·40	2·40	1·83	2·11	+3·85	5·83	1·92
Dec. ...	·67	+8·08	2·37	10·30	2·20	2·00	1·18	2·83	6·94	3·52
Totals..	22·76	52·38	33·80	66·00	25·00	34·67	19·17	30·12	50·88	35·56

IRELAND (*continued*).

Division ..	XX.			XXI.						
County. ..	Kerry	Waterford	Tipperary	Wexford	Kilkenny	Carlow	Queen's County	King's County	Wicklow	Dublin
Station....	Darrynane Abbey	Curragh-more	Clonmel	Courtown	Stoneyford	Carlow	Portarlington	Rathangan	Bray	Balbriggan
Ft. abv. sea	...	...	80	80?	220	291	240	224	250	40
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	6·53	+6·43	+6·39	4·08	3·79	3·59	3·43	3·80	3·79	+5·23
Feb. ...	5·51	5·42	4·07	2·64	3·01	2·78	2·00	2·20	3·98	3·17
March..	3·81	3·00	2·35	1·34	1·47	1·75	1·46	1·53	1·72	1·50
April ...	4·92	5·43	4·76	+4·20	3·74	4·61	3·17	3·78	3·47	3·90
May ...	—1·64	—1·22	— ·91	— ·53	— ·59	— ·41	— ·63	— ·61	— ·32	— ·59
June ...	4·19	3·77	2·28	2·52	1·77	2·37	2·33	2·32	3·08	1·47
July ...	6·42	5·91	5·39	4·05	3·89	+5·20	+5·62	+5·39	4·11	4·00
August.	2·97	4·38	2·72	3·33	2·45	2·62	1·97	1·69	1·24	2·12
Sept. ...	2·45	5·50	5·00	3·39	3·16	2·19	1·60	1·87	+4·46	4·04
Oct. ...	+7·52	6·16	6·07	4·04	+4·21	3·13	2·83	2·72	3·48	2·24
Nov. ...	3·08	5·05	3·04	2·43	1·94	1·82	1·65	1·45	1·81	1·80
Dec. ...	4·22	4·59	3·80	2·02	2·44	2·63	1·82	2·87	1·79	1·45
Totals..	53·26	56·86	46·78	34·57	32·46	33·10	28·51	30·23	33·25	31·51

MONTHLY RAINFALL IN 1871—(*continued,*)

IRELAND (*continued*).

Division ..	XXI.	XXII.		XXIII.						
County....	Westmeath	Galway	Sligo	Cavan	Armagh	Down	Antrim	London-derry	Tyrone	Donegal
Station ..	Athlone	Gort	Mount Shannon	Red Hills	Armagh Obs.	Seaford	Carrick-fergus.	Bellarena	Omagh	Dunglow
Ft. abv. sea	201	130	70	...	208	180	18	12	290	10
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January	3·93	3·60	4·11	4·33	3·43	2·97	3·41	3·58	4·11	4·37
Feb. ..	2·96	2·81	3·34	3·36	2·73	4·15	3·67	1·93	2·42	2·70
March..	2·59	3·02	3·21	2·83	·96	1·54	2·01	2·05	2·04	4·37
April ...	3·40	+4·98	3·51	3·31	3·21	+4·81	4·12	4·22	3·75	3·22
May ..	—1·21	— ·86	—1·06	— ·92	— ·26	— ·50	— ·87	— ·85	— ·67	—1·23
June ...	4·26	3·97	2·71	2·09	1·00	2·32	1·58	2·47	2·33	2·84
July ...	+6·14	4·95	+6·53	+7·82	+5·54	3·01	+5·00	+6·32	+5·79	+5·77
August.	2·98	2·14	2·66	2·46	2·15	3·19	3·97	2·51	2·19	2·29
Sept. ...	1·56	1·39	1·55	2·03	3·79	4·53	2·54	3·23	1·67	3·63
October.	3·33	3·48	3·21	2·59	2·70	2·74	2·44	2·50	2·49	4·12
Nov. ...	2·14	1·46	3·26	1·78	1·58	2·32	2·99	2·38	1·47	3·58
Dec. ...	2·36	4·18	3·35	2·52	1·05	2·09	2·45	2·17	2·50	5·53
Totals..	36·86	36·84	38·50	36·04	28·40	34·17	35·05	34·21	31·43	43·65

MONTHLY PER-CENTAGE OF RAIN IN 1871.

ENGLAND.

Month.	Middlesex.	Surrey.	Kent.	Sussex.	Hampshire.	Berks.	Herts.	Bucks.	Oxford.	Northampton.	Hunts.	Bedford.	Cambridge.	Essex.	Suffolk.	Norfolk.
Jan...	8	11	10	11	11	9	5	7	5	5	4	4	4	7	5	3
Feb...	5	4	7	10	6	5	7	6	5	6	7	5	8	6	9	9
Mar..	5	6	6	5	6	6	7	6	5	6	5	6	5	6	5	5
April.	11	13	13	13	16	13	12	13	12	12	13	10	12	10	14	14
May..	4	3	3	2	1	2	3	3	2	3	5	5	3	5	3	5
June.	14	13	10	14	13	10	11	13	15	16	16	17	17	12	13	11
July..	17	15	10	9	10	17	15	12	18	19	17	15	14	13	11	12
Aug..	3	3	3	5	5	4	4	4	2	3	2	3	5	6	6	3
Sept..	21	20	16	15	16	18	22	19	22	17	18	24	16	20	16	17
Oct...	5	4	6	7	6	6	4	8	6	5	6	4	5	7	4	7
Nov..	2	2	7	2	4	2	4	3	3	4	5	5	6	3	8	9
Dec..	5	6	9	7	6	8	6	6	5	4	2	2	5	5	6	5

ENGLAND—(*con.*)

Month.	Wilts.	Dorset.	Devon.	Cornwall.	Somerset.	Gloucester.	Hereford.	Salop.	Stafford.	Worcester.	Warwick.	Leicester.	Rutland.	Lincoln.	Notts.	Derby.
Jan....	11	10	10	13	10	5	9	8	5	6	4	3	3	3	3	4
Feb....	5	5	8	6	6	6	5	5	9	6	4	4	5	7	6	5
Mar...	5	6	6	4	6	6	4	4	4	4	5	4	4	2	3	7
April.	14	14	14	9	12	13	7	10	10	9	13	11	10	14	14	10
May..	2	3	1	1	2	5	3	4	5	5	5	7	6	5	5	6
June..	8	8	4	6	4	9	13	11	9	14	11	18	14	14	13	13
July..	16	10	10	12	10	15	11	14	13	15	18	17	22	12	16	7
Aug...	4	5	3	8	6	6	6	5	9	3	3	4	5	4	2	5
Sept..	16	14	18	16	16	18	22	16	14	21	24	19	16	17	21	16
Oct...	9	13	14	11	13	7	12	15	13	9	5	5	5	7	7	8
Nov..	2	5	3	6	4	2	3	3	4	2	3	4	6	7	5	8
Dec...	8	7	9	8	11	8	5	5	5	6	5	4	4	8	5	11

MONTHLY PER-CENTAGE OF RAIN IN 1871.

	ENGLAND—(*con.*)									WALES.						
Month.	Cheshire.	Lancashire.	Yorks, W.R.	Yorks, E.R.	Yorks, N.R.	Durham.	Northumberland	Cumberland.	Westmoreland.	Monmouth.	Glamorgan.	Carmarthen.	Pembroke.	Cardigan.	Brecon.	Radnor.
Jan...	3	4	3	3	3	4	7	11	6	7	8	10	15	11	10	11
Feb...	8	9	8	8	7	6	7	10	10	7	7	8	6	7	7	6
Mar..	4	6	3	4	4	3	5	9	5	5	5	6	4	6	8	6
April	9	7	13	11	7	11	11	6	6	7	16	9	9	9	11	12
May..	5	5	4	5	6	7	4	3	4	4	1	2	1	2	1	2
June.	13	7	13	9	16	12	7	4	4	7	4	5	4	7	6	8
July..	16	14	10	13	17	12	14	7	15	14	16	14	10	15	10	13
Aug..	5	6	4	3	3	5	7	12	14	6	8	6	6	8	8	4
Sept..	13	9	23	25	19	18	13	7	8	22	14	12	18	7	11	15
Oct...	13	20	11	6	8	9	8	9	13	11	11	14	14	14	17	15
Nov..	5	4	3	6	3	6	5	5	3	2	3	4	3	8	2	3
Dec..	6	9	5	7	7	7	12	17	12	8	7	10	10	6	9	5

	WALES—(*con.*)					SCOTLAND.										
Month.	Montgomery.	Flint.	Denbigh.	Merioneth.	Carnarvon.	Wigton.	Kirkcudbright.	Dumfries.	Roxburgh.	Selkirk.	Peebles.	Berwick.	Haddington.	Edinburgh.	Linlithgow.	Lanark.
Jan...	9	4	6	10	10	9	10	11	7	6	11	4	4	5	10	7
Feb...	6	6	7	13	8	18	10	13	13	11	9	10	12	10	10	7
Mar..	7	4	5	7	6	6	7	9	5	6	10	3	1	4	6	9
April	11	7	7	10	8	8	10	7	10	14	9	12	17	16	14	9
May..	3	6	7	4	2	2	2	2	2	3	2	6	3	4	3	2
June.	7	10	9	3	4	6	4	6	5	11	8	8	13	9	5	7
July..	14	13	12	12	17	7	10	10	16	11	10	10	9	10	9	15
Aug..	7	4	5	5	6	8	8	7	4	6	6	7	5	8	9	12
Sept..	14	17	17	9	7	4	6	2	7	7	7	12	9	9	9	6
Oct...	12	15	14	13	15	9	11	11	9	9	9	8	10	7	9	8
Nov..	4	7	5	4	6	12	10	6	7	8	6	10	12	12	7	8
Dec...	6	7	6	10	11	11	12	16	15	8	13	10	5	6	9	10

MONTHLY PER-CENTAGE OF RAIN IN 1871.

SCOTLAND—(*con.*)

Month.	Ayr.	Renfrew.	Dumbarton.	Stirling.	Bute.	Argyll, Mainland	Argyll (Insular).	Clackmannan.	Kinross.	Fife.	Perth.	Forfar.	Kincardine.	Aberdeen.	Banff.	Elgin.
Jan...	8	8	11	10	11	7	9	7	7	5	14	8	5	2	2	3
Feb...	11	11	11	12	18	11	11	15	13	9	11	14	14	12	5	5
Mar..	11	11	9	7	5	11	8	9	5	4	7	4	2	9	2	3
April	6	9	9	11	10	5	9	15	15	20	8	12	14	9	11	11
May..	2	3	3	3	1	2	3	3	2	3	2	3	2	4	3	4
June.	6	4	3	5	7	4	3	6	7	6	2	7	5	6	6	6
July..	10	10	9	11	9	10	11	9	13	15	10	12	16	12	19	19
Aug..	10	8	8	8	9	8	6	6	7	7	9	8	8	8	12	11
Sept..	8	5	3	7	7	3	9	7	7	6	3	7	6	12	20	16
Oct...	7	8	12	8	6	10	11	7	2	11	10	13	16	15	6	5
Nov..	6	9	9	7	7	11	10	8	8	10	11	6	8	6	11	12
Dec..	15	14	13	11	10	18	10	8	4	4	13	6	4	5	3	5

SCOTLAND—(*con.*) IRELAND.

Month.	Nairn.	Ross, W.	Ross, E.	Inverness, W.	Inverness, E.	Sutherland.	Caithness.	Orkney.	Shetland.	Cork.	Kerry.	Waterford.	Tipperary.	Wexford.	Kilkenny.
Jan...	3	12	8	9	4	5	6	8	11	12	12	11	14	12	12
Feb...	4	8	9	16	5	13	11	9	16	13	10	9	9	8	9
Mar..	5	12	5	9	8	6	5	8	7	6	7	5	5	4	5
April.	9	4	12	3	6	11	9	7	6	9	9	10	10	12	12
May..	2	3	1	3	2	6	4	3	4	2	3	2	2	1	2
June..	6	4	6	4	2	5	5	2	4	9	8	7	5	7	5
July..	20	9	14	10	25	14	17	9	5	11	12	10	11	12	12
Aug..	9	7	6	9	7	7	6	13	4	4	6	8	6	9	7
Sept..	21	4	13	4	12	10	11	12	5	8	5	10	11	10	10
Oct...	6	14	11	10	10	12	9	7	13	11	14	11	13	12	13
Nov..	12	8	8	7	10	5	11	13	11	5	6	9	6	7	6
Dec...	3	15	7	16	9	6	6	9	14	10	8	8	8	6	7

MONTHLY PER-CENTAGE OF RAIN IN 1871.

IRELAND—(*con.*)

Month.	Carlow.	Queen's Co.	King's Co.	Wicklow.	Dublin.	Westmeath.	Galway.	Sligo.	Cavan.	Armagh.	Down.	Antrim.	Londonderry.	Tyrone.	Donegal.
Jan...	11	12	13	12	16	11	10	11	12	12	9	10	11	13	10
Feb...	8	7	7	12	10	8	8	9	9	10	12	10	6	8	6
Mar..	5	5	5	5	5	7	8	8	8	3	5	6	6	7	10
April	14	11	12	11	12	9	14	9	9	11	14	12	12	12	8
May..	1	2	2	1	2	3	2	3	2	1	1	2	3	2	3
June.	7	8	8	9	5	12	11	7	6	3	7	5	7	7	7
July..	16	20	18	13	13	17	13	17	22	19	9	14	19	18	13
Aug..	8	7	6	4	7	8	6	7	7	8	9	11	7	7	5
Sept..	7	6	6	13	13	4	4	4	6	13	13	7	9	5	8
Oct...	9	10	9	10	7	9	9	8	7	10	8	7	7	8	9
Nov..	6	6	5	5	6	6	4	8	5	6	7	9	7	5	8
Dec...	8	6	9	5	4	6	11	9	7	4	6	7	6	8	13

ABSTRACT.

Month.	Engl'nd	Wales.	Scotl'nd	Ireland.	British Isles.	Highest.		Lowest.	
January	6·4	9·3	7·4	11·7	8·7	16	Dublin	2	Aberdeen. Banff.
February... .	6·6	7·3	11·0	9·0	8·5	18	Wigton .... Bute	4	Surrey, Warwick. Leicester, Nairn.
March	5·1	5·7	6·6	6·0	5·9	12	W. Ross	1	Haddington.
April	11·4	9·7	10·2	11·0	10·6	20	Fife	3	W. Inverness.
May..	3·9	2·9	2·9	2·0	2·9	7	Leicester ..... Durham .... Denbigh	1	Hants, Devon, Cornwall. Glamorgan, Pembroke, Brecon, Bute, E. Ross. Wexford, Carlow, Wicklow, Armagh, Down.
June	11·4	6·2	5·7	7·1	7·6	18	Leicester	2	Perth, E. Inverness, Orkney.
July	13·6	13·3	12·1	14·7	13·4	25	E. Inverness.....	5	Shetland.
August	4·8	6·1	7·8	7·0	6·4	14	Westmoreland	2	Oxford, Hunts, Notts.
September ..	17·4	13·6	8·2	8·2	11·9	25	Yorks, E. Riding.....	2	Dumfries.
October	8·3	13·8	9·7	9·6	10·3	20	Lancashire	4	Surrey, Herts, Bedford, Suffolk.
November ...	4·3	4·2	8·9	6·3	5·9	13	Orkney	2	Middlesex, Surrey, Sussex, Berks. Wilts, Gloster, Worcester, Monmouth. Brecon.
December ..	6·8	7·9	9·5	7·4	7·9	18	Argyll (Mainland) ...	2	Hunts, Bedford.

The foregoing tables place before us in the clearest possible light the relative fall in each month in every part of the British Isles, and the sixth column of the abstract sums up the whole matter. From it we learn, that, on the whole, *July was the month of greatest rainfall, although it was surpassed in England by September, and in Wales by October. By very far the driest month was May, and it was almost equally dry in all parts of the country.*

We notice one feature in the tables which calls for further investigation, namely, the ordinary evenness of distribution throughout Ireland. It is easy to understand that a generally flat country should have an equable rainfall, and that it should be similarly distributed throughout the year; but it is not equally clear why a more hilly country should, in addition to the yearly inequality due to irregularity of surface, have a more uneven monthly distribution. We have hitherto regarded monthly distribution as due to the varying areas occupied by conflicting ærial currents, but if it should prove to be the case that the irregularity is less in flat districts, we shall be led to another indication of the influence of the configuration of the land upon the currents of the atmosphere. This question is, however, too large to discuss incidentally.

We have next to submit the results of another mode of considering the question, which may be thus described:—(1) A number of stations are selected, sufficient to fairly represent the whole of the British Isles, the distance between them averaging about 30 miles. (2) For each of these stations the mean monthly average during the years 1860–65 is tabulated, as is also (3) the fall in each month of 1871. From these data (4) the ratio of the actual fall to the mean fall has been computed, and (5) the results have been laid down on a series of 12 maps. From these maps the following notes are drawn up :—

JANUARY.

Rainfall above the average in South Wales, parts of Devon, Worcester, and Kent; below it in all other places; and less than half the average in the midland counties of England, in Yorkshire, and at some stations on the east of Scotland.

FEBRUARY.

In England the fall was above the average, excepting in Kent, Herts, Oxon, and Leicester; it was also above it at all Welsh stations, and at most of those in Scotland and Ireland. In Skye the fall was only

three-quarters of the average, while on the east coast of Scotland it was more than double the usual amount.

MARCH.

Much drier than usual. Only a few isolated stations had the average fall, many less than half, and the east of Ireland and north-east of England less than one-third the average amount.

APRIL.

Quite a contrast to the previous month. Excepting in the Hebrides and some parts of the English Lake District, the fall exceeded the average; at most stations it was more than twice the average, at many it was more than than three times the average, and in the counties of Fife and Forfar it was more than *four times* the average. The following are instances (taking the average as 100):—Forfarshire, Barry, 425 ; Craigton, 422 ; Hill Head, 402 ; Fife, Nookton, 416.

MAY.

A very dry month, the rainfall scarcely half the average, and at stations in the west of England, South Wales, and Ireland scarcely one-quarter. There appears not to be any station which had its usual amount.

JUNE.

Another rather dry month, but not uniformly so ; in fact, the distribution was irregular. The east of England and the south-east of Ireland had about one-third more than their average, while in the north and west of Scotland the fall was not a quarter of the usual amount.

JULY.

This wet month was much more so than usual. At a great many stations the fall was twice the average, and at some two and a half times; it seems, moreover, to have been uniformly wet over the whole of the British Isles.

AUGUST.

The ordinary rainfall of this month was not nearly half the average amount, and, therefore, the only stations which received their average were those visited by the thunderstorms of August 13th, 14th, and subsequent days; as, however, these were very local, the final result is a very low average for the month.

SEPTEMBER.

The rainfall of this month was very irregularly distributed. It was very much below the average in Scotland and the west of Ireland, near its normal value in North Wales, and about two or two and a half times its usual amount in South Wales and throughout England. That this excess is unusual in September is shown by the following facts:—(1) At Cobham, during 46 years, the fall in September, 1871 (4·72), was only twice exceeded, viz., in 1826 (5·17) and in 1839 (5·74); (2) at Shiffnal, during 37 years, the fall in 1871 (5·27) has only been exceeded once, viz., in 1866, when 5·40 in. fell; (3) at Broadhembury, during 35 years, the fall in September, 1871, was only once exceeded, viz., in the year 1866.

OCTOBER.

The fall this month was pretty evenly distributed. It was rather in excess along a belt running from Penzance to York, but in most other parts it was only between half and three-quarters of its usual amount.

NOVEMBER.

This month was a dry one, very few stations (except in Scotland) having half their average fall, those in the south-east of England not one quarter of it.

DECEMBER.

Slightly below the average in the south of England, in Scotland, and in Ireland, and slightly above it in the north of England and in parts of Wales.

EXTREMES OF RAINFALL IN 1871.

ENGLAND.

Greatest.			Least.		
Div.		in.	Div.		in.
X.	Seathwaite	115·15	III.	Pampesford Hall, Cambridge.	18·60
,,	Kirkstone Pass	98·22	,,	Cherry Hinton, ,,	18·90
,,	Grasmere (Easedale Tarn)	92·00	VII.	Southwell	19·02
,,	Haweswater (Mardale Green)	83·40	III.	Royston	19·07
V.	Dartmoor Prison Garden	79·63	VII.	Wytham-on-the-Hill	19·09
X.	Patterdale Hall	76·39	III.	Cambridge Observatory	19·12

WALES.

Greatest.			Least.		
Div.		in.	Div.		in.
XI.	Beddgelert	110·89	XI.	Maes-y-dre	24·63
,,	Pen-y-gwyrd	99·43	,,	Great Orme's Head	24·90
,,	Aberdare	81·60	,,	Llannerch, St. Asaph	27·12
,,	Rhiw Bryfdir	79·94	,,	Trevalyn Hall, Rosset	27·46
,,	Head of Vyrnwy	71·50	,,	Brynbella, St. Asaph	27·96
,,	Dylive	70·70	,,	Brymbo	28·23

SCOTLAND.

Greatest.			Least.		
Div.		in.	Div.		in.
XV.	Bridge of Orchy	137·82	XIX.	Invershin	20·18
XVIII.	Sligachan	101·00	,,	Invergordon	21·33
XV.	Loch Lomond (Firkin)	97·80	,,	Dingwall Academy	22·19
XVI.	Glen Gyle	90·10	XVII.	Nairn	22·76
XVIII.	Glenquoich	90·00	,,	Tillypronie	23·85
XV.	Ballachulish	83·59	,,	Logie, Coldstone	24·27

IRELAND.

Greatest.			Least.		
Div.		in.	Div.		in.
XX.	Killarney	62·72	XXIII.	Agolah	24·17
,,	Curraghmore	56·86	XXI.	Monkstown	25·04
,,	Darrynane Abbey	53·26	,,	Dublin (Fitzwilliam Square)	25·37
XXIII.	Letterkenny	52·63	XXIII.	Miltown, Banbridge	25·40
XXI.	Tullogher	52·02	,,	Armagh	28·40
,,	Ballyhyland	47·41	XXI.	Portarlington	28·51

COMPARISON OF THE RAINFALL IN 1871 WITH PREVIOUS YEARS.

ENGLAND AND WALES.

Div.	STATION.	COUNTY.	Average			Depth in 1871.	Difference from Average, 1860-5	
			1840-9.	1850-9.	1860-5.		Amount.	Per cent
			in.	in.	in.	in.	in.	
I.	Camden Town	Middlesex	...	(24·30)	25·01	25·02	·01	+ 0
II.	Chichester Infirmary	Sussex	29·10	26·67	29·01	25·86	3·15	— 11
,,	,, (Shopwyke)	,,	...	26·25	28·41	26·19	2·22	— 8
,,	,, (Chilgrove)	,,	33·41	32·23	32·77	33·19	·42	+ 1
,,	,, (W. Dean)	,,	...	35·30	37·02	34·39	2·63	— 7
,,	Uckfield Observatory	,,	...	30·03	31·50	25·64	5·86	— 19
,,	Ventnor, Isle of Wight	Hants	...	28·46	29·26	24·91	4·35	— 15
III.	Hemelhempstead	Herts	25·86	26·43	25·47	23·49	1·98	— 8
,,	Berkhempstead	,,	...	28·05	28·02	25·36	2·66	— 10
,,	Hitchin	,,	..	24·72	23·25	20·84	2·41	— 10
,,	High Wycombe	Bucks	...	23·20	24·29	20·94	3·35	— 14
,,	Althorp	Northants	...	20·34	21·77	22·43	·66	+ 3
,,	Cardington (8 in. gauge)	Bedford	...	21·60	21·87	21·20	·67	— 3
IV.	Witham	Essex	...	20·55	20·73	20·77	·04	+ 2
,,	Norwich (Honingham)	Norfolk	...	25·99	23·28	24·56	1·28	+ 6
,,	Holkham	,,	...	26·13	23·10	22·28	·82	— 4
V.	Plymouth (Ham)	Devon	...	44·70	42·17	45·75	3·58	+ 8
,,	Exeter Institution	,,	29·35	26·91	30·17	32·50	2·33	+ 8
,,	Honiton (Broadhembury)	,,	35·14	32·75	34·28	34·38	·10	+ 3
,,	Helston	Cornwall	...	36·22	38·05	41·60	3·55	+ 9
,,	Bodmin	,,	...	43·48	46·12	49·12	3·00	+ 6
VI.	Cirencester	Gloucester	...	29·60	30·87	32·40	1·53	+ 5
,,	Burford	Shropshire	...	25·52	26·25	31·25	5·00	+ 19
,,	Shiffnal (Haughton Hall)	,,	...	24·02	23·74	26·06	2·32	+ 10
,,	Orleton	Worcester	28·41	28·82	30·06	30·99	·93	+ 3
VII.	Wigston	Leicester	...	26·39	26·49	24·28	2·21	— 8
,,	Southwell	Notts	...	19·65	19·54	19·02	·52	— 3
,,	Welbeck	,,	25·44	23·29	24·02	25·48	1·46	+ 6
,,	Derby	Derby	...	23·98	25·14	28·70	3·56	+ 14
VIII.	Bolton (The Folds)	Lancashire	46·46	44·01	48·33	40·93	7·40	— 15
,,	,, (Belmont)	,,	...	51·19	55·70	46·80	8·90	— 16
,,	Preston (Howick)	,,	...	34·28	38·09	34·25	3·84	— 10
,,	Ormskirk (Rufford)	,,	...	33·24	34·81	31·95	2·86	— 8
,,	Holker	,,	...	39·17	44·98	42·41	2·57	— 6
IX.	Redmires	Yorkshire	40·75	37·86	37·89	34·82	3·07	— 8
,,	Standedge	,,	...	49·58	52·17	42·25	9·92	— 19
,,	Halifax (Well Head)	,,	31·88	30·71	31·09	27·90	3·19	— 10
,,	Leeds (Holbeck, M. & Co.)	,,	...	20·91	21·98	22·80	·82	+ 4
,,	York	,,	25·42	22·02	23·38	28·68	5·30	+ 23
X.	Seathwaite	Cumberland	...	126·98	153·47	115·15	38·32	— 25
,,	Keswick (Post Office)	,,	...	55·01	60·56	46·18	14·38	— 24
,,	Kendal (Kent Terrace)	Westmorel'nd	51·18	44·91	52·88	50·25	2·63	— 5
XI.	Holywell (Maes-y-dre)	Flint	..	24·25	23·58	24·63	1·05	+ 4
,,	Guernsey	Channel Isds.	...	34·46	37·09	36·26	·83	— 2

COMPARISON OF THE RAINFALL IN 1871 WITH PREVIOUS YEARS.

SCOTLAND.

Div.	STATION.	COUNTY.	Average 1840-9.	Average 1850-9.	Average 1860-65.	Depth in 1871.	Difference from Average, 1860-5 Amount.	Per cent
			in.	in.	in.	in.	in.	
XII.	Mull of Galloway	Wigtown	20·67	22·52	28·31	24·22	4·09 —	14
,,	Little Ross	Kirk'udbright	...	25·27	27·35	27·60	·25 +	1
XIII.	Haddington	Haddington. .	23·77	24·35	26·93	25·42	1·51 —	6
,,	Cobbinshaw	Edinburgh ...	...	35·65	35·65	36·40	·75 +	2
,,	Glencorse	,,	...	36·96	36·77	34·35	2·42 —	7
,,	Inveresk	,,	25·81	24·72	30·05	30·42	·37 +	1
XIV.	Bothwell Castle	Lanark	...	27·76	28·33	28·22	·11 —	4
,,	Largs (Mansfield)	Ayr	...	43·06	48·63	42·80	5·83 —	12
XV.	Arddaroch	Dumbarton...	...	66·55	75·83	71·40	4·43 —	6
,,	Pladda	Bute	40·02	35·23	38·12	37·18	·94 —	2
,,	Mull of Cantyre	Argyll ..	45·76	41·19	44·61	45·77	1·16 +	3
,,	Rhinns of Islay	,,	33·79	30·58	32·66	34·76	2·10 +	6
,,	Castle Toward	,,	...	47·88	53·80	48·10	5·70 —	11
,,	Tyree (Hynish)	,,	...	73·90	84·77	57·38	27·39 —	32
,,	Lismore	,,	...	38·44	46·95	35·78	11·17 —	24
,,	Ardnamurchan	,,	...	38·50	47·94	37·61	10·33 —	21
XVI.	Isle of May	Fife	20·94	15·21	21·08	21·59	·51 +	2
,,	Deanston	Perth	35·74	39·21	42·35	41·81	·54 —	1
,,	Dundee (Hill Head)	Forfar	...	31·06	35·59	39·15	3·56 +	10
,,	,, (Craigton)	,,	...	31·87	35·64	40·41	4·77 +	13
,,	Arbroath	,,	...	25·08	29·71	26·69	3·02 —	10
XVII.	Girdleness [Aberdeen]	Kincardine ...	23·14	19·71	22·13	20·61	1·52 —	7
,,	Kinnairdhead	Aberdeen	22·01	22·05	23·32	34·65	11·33 +	49
XVIII	Cromarty	Cromarty ...	..	23·67	27·80	20·87	6·93 —	25
,,	Barrahead	Inverness ...	31·60	32·67	32·62	30·89	1·73 —	5
,,	Cape Wrath	,,	38·86	36·94	39·59	33·12	6·47 —	16
,,	Noss Head	,,	...	25·57	23·57	18·91	4·66 —	20
XIX.	Pentland Skerries	Caithness ...	...	24·12	28·92	21·36	7·56 —	26
,,	Sandwick	Orkney	...	36·14	36·79	32·17	4·62 —	13
,,	Start Point	,,	25·05	23·77	24·32	38·64	14·32 +	59
,,	Sumburghhead	Shetland	25·43	25·22	25·52	23·69	1·83 —	7
,,	Bressay Manse	,,	...	36·22	40·40	38·10	2·30 —	6

IRELAND.

XX.	Cork	Cork	41·30	34·23	34·41	35·66	1·25 +	4
,,	Killaloe	Clare	...	38·33	46·70	40·70	6·00 —	13
,,	Tullamore	King'sCounty	...	24·37	28·09	29·09	1·00 +	4
XXI.	Black Rock	Dublin	23·20	21·78	25·83	28·11	2·28 +	9
XXIII	Armagh	Armagh	...	(28·20)	32·40	28·40	4·00 —	12

ABSTRACT.

England	...	33·05	34·95	32·82	2·13 —	3
Scotland	...	33·16	36·75	34·38	2·37 —	4
Ireland	...	29·38	33·48	32·39	1·09 —	2
Mean of the whole	...	31·86	35·06	33·20	1·86 —	3

ON THE RAINFALL OF THE YEAR 1871.

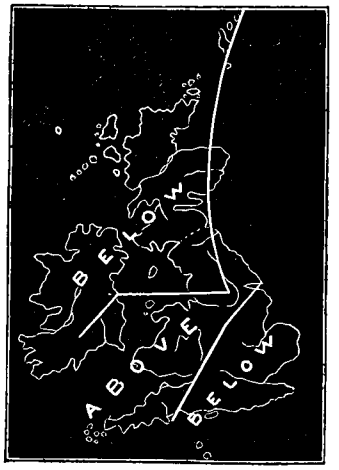
WE must refer our readers to the "Comparison Tables" on the two preceding pages for precise details as to the relation of the total fall during 1871 to the average of previous years. We do this somewhat prominently, because the distribution seems to have been so peculiar that readers should judge for themselves of the correctness of our interpretation of the facts shown by the tables.

(1) A line drawn from Torquay to Nottingham and thence to Spurn Head would apparently have on its eastern side stations with *less* than their average fall.

(2) A line drawn from Tipperary north-eastward to the coast above Dublin, thence due east to Chesterfield, and thence northward, with a slight curvature to the west, to the Shetland Isles, would have on its western side stations with *less* than their average fall.

(3) Stations between these two lines had *more* than the average.

These lines are roughly indicated in the following map.



We shall not be surprised to hear that these curves are improbable and unnatural. Their form is certainly unusual, and they do not satisfy *all* the observations, but we believe that, on the whole, they are correct. It is easy to see that the sudden arrest of the upper line near Chesterfield is due to the heavy rain of September 6th, referred to on page 126, and so with other features in the curves. Their special interest, however, certainly lies in the district where they approach so closely, and are yet so clearly separated. In order to render the details of this matter intelligible and evident to every one, we have prepared

the following table, showing the per-centage of difference between the rainfall at 76 stations in the district during 1871 and the mean at the same stations during the ten years 1860–69. We have adopted that period instead of 1860–65, solely because the averages happen to be computed for a larger number of stations, and are therefore more complete. The two periods only differ about three per cent., and as they do so uniformly, on this ground also there is no objection to using the 1860–69 averages.

Difference between the Total Fall of Rain in 1871 *and the Mean Fall during the ten years* 1860–69.

(Expressed as per-centage of mean annual fall.*)

SHROPSHIRE—Shiffnal	+	5	CHESHIRE—(*con.*)		
Shrewsbury	+	10	Woodhead	—	16
Oswestry	+	1	LANCASHIRE—Denton	—	12
LEICESTERSHIRE—Wigston	—	4	Gorton	—	12
Thornton Reservoir	+	2	Manchester, Old Trafford	—	4
Belvoir Castle	—	4	,, Ardwick	—	3
LINCOLNSHIRE—Grantham	—	1	,, Piccadilly	—	4
Market Rasen	—	2	Fairfield	—	11
Gainsborough	+	3	Oldham Waterhouses	+	2
Stockwith	+	8	,, Gas Works	—	13
Brigg		0	Bolton (The Folds)	—	16
Grimsby	+	6	,, Belmont	—	17
Barnetby	+	24	,, Heaton	—	9
Brigg, Appleby Vicarage	+	7	Rochdale, Nagden Dane	—	21
New Holland	+	8	Ormskirk, Rufford	—	9
NOTTINGHAM—Southwell	—	9	Preston, Howick	—	11
Welbeck Abbey	+	4	Blackpool, Southshore	—	9
Worksop	+	13	Stonyhurst	—	10
Retford	+	3	Clitheroe, Downham Hall	—	15
DERBY—Derby	+	7	Lancaster, Caton	—	10
Chesterfield	+	1	Cartmel, Holker	—	7
Kilnarsh, Norwood	+	11	YORKSHIRE—		
Combs Moss	—	7	Sheffield, Broomhall Park	—	2
Combs Reservoir	—	10	Redmires	—	12
Chapel-en-le-Frith	—	1	Tickhill	+	10
Woodhead	—	22	Dunford Bridge	—	16
CHESHIRE—Bosley Minns		0	Saddleworth Station	—	10
Bosley Reservoir	+	7	Standege	—	21
Macclesfield	+	5	Huddersfield, Longwood	—	44
,, Park Green	—	11	Halifax, Warley Moor	—	23
Bollington, Spond's Hill	—	13	,, Well Head	—	16
Whaley	—	12	,, Midgeley Moor	—	21
Marple Aqueduct	—	26	,, Ovenden Moor	—	20
,, Top Lock	—	21	Leeds, Leventhorpe Hall	+	9
Godley Reservoir	—	7	Holbeck		0
Mottram, Matley's Field	—	8	York, Bootham	+	17
Newton	—	1	Hull, Beverly Road	+	3
Arnfield Reservoir	—	9	Malton	+	1
Rhodes Wood Reservoir	—	16	Richmond, Aske	—	7

* The formation of this table is precisely similar to those on pages 154 and 155, but as only the last column is required for this discussion it alone is printed.

It is unnecessary to occupy further space in discussing this subject. Those who will take the trouble to plot the above values on a map will find them very instructive, and rather difficult of complete solution. We may give one instance: it would naturally be supposed as the separating line runs northward roughly parallel with the Pennine chain and at no great distance from it, that it would prove to be the true line; and that as the separating line passes near the Woodhead range of hills, one side would show excess, and the other deficiency, but this is not the case; on the west side the two Woodhead gauges show deficiencies of 16 and 22 per cent. respectively, while on the east Dunford Bridge gives nearly the same, 16; at Redmires it decreases to 12; and at Sheffield it drops to 2. We then come to the belt of excess, and find Tickhill + 10, Retford and Gainsborough + 3, and finally, having crossed the belt of excess we have again a deficiency (−3) at Market Rasen.

Before leaving the question of general distribution during 1871, we must point out that the tables on pages 154 and 155 show that over *England and Wales, considered as a whole, there was a deficiency of three per cent.; in Scotland of four per cent.; in Ireland of two per cent. So that over the British Isles generally the fall was about three per cent. below the average.*

The table on page 153, showing Extremes of Rainfall in 1871, calls for no special comment, the fluctuations being less than usual; attention may, however, be drawn to the fact that in 1871 Seathwaite *was not* the wettest spot in the British Isles.

GENERAL TABLES

OF

TOTAL RAINFALL IN 1871,

AT ABOUT

1500 STATIONS

IN THE

BRITISH ISLES.

SUGGESTIONS FOR SECURING UNIFORMITY OF PRACTICE AMONG RAINFALL OBSERVERS.*

I.—SITE.—A rain gauge should not be set on a slope or terrace, but on a level piece of ground, at a distance from shrubs, trees, walls, and buildings—at the very least, as many feet from their base as they are in height. Tall-growing flowers, vegetables, and bushes must be kept away from the gauge. If a thoroughly clear site cannot be obtained, shelter is most endurable from N.W., N., and E., less so from S., S.E., and W., and not at all from S.W. or N.E.

II.—OLD GAUGES.—Old established gauges should not be moved, nor their registration discontinued until, at least, two years after a new one has been in operation, otherwise the continuity of the register will be irreparably destroyed. Both the old and the new ones must be registered at the same time and the results recorded for comparison.

III.—LEVEL.—The funnel of a rain gauge must be set quite level, and so firmly fixed, that it will remain so in spite of any gale of wind or ordinary circumstance. Its correctness in this respect should be tested from time to time.

IV.—HEIGHT.—The funnel of gauges newly placed should be 1 ft. above grass. Information respecting height above sea level may be obtained from the Editor.

V.—RUST.—If the funnel of a japanned gauge becomes so oxidised as to retain the rain in its pores, or threatens to become rusty, it should have a coat of gas tar, or japan black, or a fresh funnel of zinc or copper should be provided.

VI.—FLOAT GAUGES.—If the measuring rod is detached from the float, it should never be left in the gauge. If it is attached to the float, it should be pegged or tied down, and only allowed to rise to its proper position at the time of reading. To allow for the weight of the float and rod, these gauges are generally so constructed as to show 0 only when a small amount of water is left in them. Care must always be taken to set the rod to the zero or 0.

* Our sole object in drawing up these rules has been to ensure uniformity and accuracy. Any observer who objects to, or can suggest improvements in any one of them, will oblige by forwarding the substitute he would prefer, and a short statement of his reasons for so doing. These shall appear in the next issue of the *Meteorological Magazine*, and the rule shall be altered or not, as decided by the observers themselves.

VII.—Can and Bottle Gauges.— The measuring glass should always be held upright; the reading is to be taken midway between the two apparent surfaces of the water.

VIII.—Time of Reading.—Nine a.m. daily; if only taken monthly, then 9 a.m. on 1st.

IX.—Date of Entry.—The amount measured at 9 a.m. on any day is to be set against the previous one; because the amount registered at 9 a.m. of, say, 17th contains the fall during 15 hours of the 16th, and only 9 hours of the 17th. *(This rule has been approved by the Meteorological Societies of England and Scotland, cannot be altered, and is particularly commended to the notice of observers.)*

[Far be it from us to complain of those who by regular and careful observation provide the materials on which this work is founded, but we do wish they would *all* conform to this rule. We believe that some think it is of little consequence, and others are not aware how strongly it has been endorsed by the only meteorological societies in the country. Perhaps the former will take into consideration the fact that besides giving hours of extra work, it seriously impairs the value of their registers. For the information of the latter class of observers, *verbatim* extracts from the reports of the councils of the two societies are annexed.]

"Mr. Buchan stated that the mode of entering the rainfall by the Society's observers was not uniform; some, by far the greater number, entering the rain read off on the 1st of the month as the fall for that day, others entering it as the fall for the last day of the previous month. He recommended, as it is most desirable that one uniform method be adopted, that observers be instructed to read the rain gauge at 9 a.m., and enter that reading for the day previous; and where the readings are not taken daily, that the gauge be always read on the 1st of each month, and the amount then collected be considered as belonging to the previous month, and entered accordingly. The Council agreed to sanction this recommendation, and would strongly urge those observers who have not yet adopted it, to do so without delay."—*Minute of Council of the Scottish Meteorological Society, April*, 1866.

"The date to which each measurement of rain is to be entered (and which, therefore, involves the termination of the rain month) having been referred to the observers, to ascertain the general practice, it was found that the majority were in favour of 9 a.m., and placing the amount then measured against the day preceding that on which it was measured. This regulation met Mr. Glaisher's approval, and has also received the support of the Council of the Scottish Meteorological Society, who have passed a minute instructing their observers to adopt it. By these means it is hoped that very shortly the practice will be uniform throughout the United Kingdom."—*Report of the Council of the Meteorological Society, June*, 1866.

X.—Mode of Entry.—If less than one-tenth (·10) has fallen, the cypher must *always* be prefixed; thus, if the measure is full up to the seventh line, it must be entered as ·07, that is, no inches, no

tenths, and seven hundredths. For the sake of clearness, it has been found necessary to lay down an invariable rule that there shall always be two figures to the right of the decimal point. If there be only one figure, as in the case of one-tenth of an inch (usually written ·1) a cypher must be added, making it ·10. Neglect of this rule causes much inconvenience. All columns should be cast *twice*—once up and once down, so as to avoid the same error being made twice. When there is no rain, a line should be drawn rather than cyphers inserted.

XI.—Caution.—The amount should always be written down before the water is thrown away.

XII.—Small Quantities.—The unit of measurement being ·01, observers whose gauges are sufficiently delicate to show less than that, are, if the amount is under ·005, to throw it away, if it is ·005 to ·010 inclusive, they are to enter it as ·01.

XIII.—Absence.—Every observer should train some one as an assistant; but where this is not possible, instructions should be given that the gauge should be emptied at 9 a.m. on the 1st of the month, and the water bottled, labelled, and tightly corked, to await the observer's return.

XIV.—Heavy Rains.—When very heavy rains occur, it is desirable to measure immediately on their termination, and it will be found a safe plan after measuring to return the water to the gauge, so that the morning registration will not be interfered with. Of course if there is the slightest doubt as to the gauge holding all that falls, it must be emptied, the amount being *previously* written down.

XV.—Snow.—In snow three methods may be adopted—it is well to try them all. (1) Melt what is caught in the funnel by adding to the snow a previously ascertained quantity of warm water, and then deducting this quantity from the total measurement, and measure that as rain. (2) Select a place where the snow has not drifted, invert the funnel, and turning it round, lift and melt what is enclosed. (3) Measure with a rule the average depth of snow, and take one-twelfth as the equivalent of water. Some observers use in snowy weather a cylinder of the same diameter as the rain gauge, and of considerable depth. If the wind is at all rough, all the snow is blown out of a flat-funnelled rain gauge.

XVI.—Overflow.—It would seem needless to caution observers on this head, but as a recent foreign table contains *six instances on one day* in which gauges were allowed to run over, it is evidently necessary that British observers should be on the alert.

ARRANGEMENT OF GENERAL TABLES.

The divisions are the same as those adopted by the Registrars General of England and Scotland.

The boundaries of these divisions are shown on the map facing page 131 of *British Rainfall*, 1870.

The counties follow the same order as in the reports of the beforementioned officers.

An alphabetical list of the counties is given, with the page or pages on which all returns from each will be found.

The stations in each county are arranged in the order of their latitude from South to North.

In order to facilitate finding the fall in any part of the country, the first name is almost always that of a place given in *Bradshaw*, the *British Postal Guide*, or the *Clergy List;* the second name is added occasionally to fix accurately the site of Observation. In a very few instances, this second name is in [ ] instead of ( ); it shows the nearest town, which is then in an adjoining county. For instance, "Lowestoft (Gisleham)" means Gisleham, near Lowestoft, both being in one county, but "Geldeston [Beccles]" means Geldeston, Norfolk, near Beccles, in another county—Suffolk.

The contents of the columns are sufficiently explained by the headings, except that in the column headed "diameter" figures will occasionally be noticed of a different type from the rest of the tables; these figures indicate the length of the sides of rectangular mouthed gauges. These measurements are all in inches.

An asterisk * denotes that the gauge was tested before erection, and a † that it has been visited and examined since. A note of interrogation (?) implies doubt, not necessarily error. ... indicates the absence of information.

BA is employed to indicate gauges originally provided out of the funds of the British Association.

In the column of altitudes several symbols are used, their meaning is as follows:—T, that a series of levels have been taken from the gauge to an Ordnance bench mark; t, that the height is estimated or ascertained approximately from the same source; L, that levels have been taken from the gauge to the sea, or to some datum other than Ordnance mean sea level; B, that the altitude has been taken by the barometer; and ?, that the height is uncertain.

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ENGLAND AND WALES.

DIVISION I.—MIDDLESEX.

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground ft.	in.	Height Above Sea Level feet.	Depth of Rain. 1871 inches.	Days on which ·01 or more fell.
MIDDLESEX.							
Hampton Wick (The Grove) ...	T. J. Nelson, Esq.....	5	1	1	27 ⊼	22·75	136
„ (Fairlight).....	C. Mostyn, Esq.....	8	0	5	30?	24·03	124
Teddington (Gomer House)	R. D. Blackmore, Esq...	5	0	10	26 ⊼	22·98	154
Twickenham (Fulwell)	J. J. Hall, Esq.	8	1	0	47 ⊼	22·42	148
Kensington (Holland Road).....	H. Doxat, Esq.	5	1	0	..	23·41	...
Westminster(SpringGrdns),S.W.	JW Bazalgette,Esq.CE	8	6	0	37 ⊼	22·00	116
„ „ „	„ „ „ ...	12	58	3	95 ⊼	20·85	...
„ „ „	„ „ „ ...	8	58	6	95 ⊼	19·91	...
London (Guildhall), E.C.	W. Haywood, Esq.C.E	8	2	6	49	21·63	132
„ „	„ „ „	8	51	0	98	21·40	132
„ (Chiswell Street), E.C....	A. Slate, Esq	5	51	0	...	20·13	119
„ (Mile End), E.	F. Charrington, Esq....	5	13	6	46 T	21·69	135
„ Regent's Park R. Bot. Soc	W. Sowerby, Esq.....	8	1	0	126 ⊼	23·72	155
† „ (Camden Square), N.W..	G. J. Symons, Esq. ...	8	0	6	111 ⊼	25·02	155
„ Islington(St.Mary'sRoad),N.	W. T. Reynolds, Esq...	5	1	0	117 ⊼	24·58	145
„ „ (Compton Terrace).	Dr. Ballard	8	0	6	122 ⊼	24·34	148
†Holloway Road	W. B. Kesteven, Esq..	5	1	3	95 T	25·24	161
*Kentish Town Reservoir Bank...	G. J. Symons, Esq. ...	5	1	0	200 T	24·95	...
*Upper Clapton (Hadham Ho.) ...	J. Parnell, Esq.....	5	1	1	91 B	24·07	158
Hampstead, N.W. (Roslyn Ho.)	C. H. L. Woodd, Esq..	8	1	3	375 T	24·79	...
† „ (Squire's Mount).....	Rogers Field, Esq. C.E.	5	1	0	385 ⊼	23·47	158
†Highgate Nurseries	J. Cutbush, Esq.	5	1	0	394 T	23·73	122
Harrow-on-the-Hill	T. Hewlett, Esq.	5	1	2	354 ⊼	22·94	210
„ (Northwick House)	H. St. J. Joyner, Esq.	5	0	6	200 ⊼	23·58	162
Stamford Hill.....	N. F. Robarts, Esq. ...	5	0	11	110 T	23·74	171
†Tottenham (Grove Ho.).....	Charles Ashford, Esq..	5	1	0	55 T	24·31	178
Uxbridge (Harefield Park)	W. F. Vernon, Esq. ...	8	0	8	296 ⊼	22·56	135
Enfield (Nag's Head Lane)	W. C. Mylne, Esq. ...	...	3	0	89	26·44	173
†Winchmore Hill	T. Paulin, Esq.	8	1	0	350?	23·12	145
„ „	„ „ „	5	1	0	350?	23·17	145
„ „	„ „ „	5	5	6	350?	23·11	145

DIVISION II.—SOUTH-EASTERN COUNTIES.

STATIONS.	AUTHORITIES.	Rain Gauge.			Depth of Rain.	Days on which .01 or more fell
		Diameter.	Height Above Ground.	Height Above Sea Level	1871	
			ft. in.	feet.	inches.	
SURREY.						
Godalming (Dunsfold)	Mr. T. Underwood	5	2 6	166	25·20	...
Weycombe [Haslemere]	G.B.Buckton,Esq.FRS	5	4 0	583 ⅄	30·79	...
Guildford (Cranleigh)	Rev. R. W. Tayler	5	0 8	...	26·19	...
Farnham (Culverlands)	Miss Gibson	5	1 1	300 B	26·58	169
Gomshall	F. Evershed, Esq.	5	1 5	259 ⅄	28·95	...
Guildford (Shalford Common)	Capt. James, R.E.	10	1 6	115 ⅄	25·25	114
Albury (Postford)	J. Pares, Esq.	5	1 6	200 ⅄	29·84	...
†Guildford (Commercial Road)	Capt. James, R.E.	10	1 6	120 ⅄	26·44	...
† „ (Roy. Grammar Sch.)	Rev. Dr. Merriman	5	1 6	187 ⅄	25·14	139
„ (Guildown)	Miss J. G. Hadden	5	1 0	190	23·87	151
Dorking (West Street)	Mrs. W. A. Marsh	10	35 0	234 T	29·15	142
„ (Brookmead)	T. L. M. Winter, Esq.	4	0 9	180 ⅄	28·20	...
„ (The Denbies)	G. Cubitt, Esq., M.P.	5	1 0	610 T	33·35	165
Red Hill (Earlswood Asylum)	Dr. Grabham	5	1 2	...	25·66	...
Caterham (Upwood Gorse)	J. Tomes, Esq., F.R.S.	5	0 10	715 T	28·47	...
†Cobham (Pyports)	G. Dines, Esq.	8	1 0	65 ⅄	23·60	177
Chobham (Northbourne)	Dr. Ward	8	1 2	93 ⅄	21·82	132
†Weybridge Heath	W. F. Harrison, Esq.	8	0 6	150 ⅄	23·22	...
Croydon (South Bridge)	Dr. Westall	5	1 0	152 ⅄	24·54	140
„ (Tanfield Lodge)	J. Weston, Esq.	5	0 8	155 T	24·18	160
„ (Belfield)	J. Rickett, Esq.	5	7 6	180 ⅄	23·66	141
„ (Waldronhurst)	C. W. Johnson, Esq.	8	35 0	237 ⅄	20·24	119
„ (Waddon House)	P. Crowley, Esq.	9	3 0	...	22·06	124
Wimbledon	T. Devas, Esq.	12	3 0	160	22·50	147
Upper Tooting	D. A. Freeman, Esq.	5	0 6	86	24·77	...
*Brixton Hill	Miss E. Sweeting	5	1 0	127 T	24·71	158
Richmond (Halford House)	Edward Mawley, Esq.	5	0 9	...	22·34	159
†Kew Observatory	The Kew Committee	10	1 3	19 T	21·44	139
Kennington Road	A. H. Thorns, Esq.	8	5 0	19 ⅄	22·32	136
KENT.						
†Rolvenden (Maytham Hall)	R. Appach, Esq.	8	1 2	120 T	23·60	159
Tenterden	J. Ellis Mace, Jr., Esq.	8	2 0	...	21·98	142
†Hythe	H. B. Mackeson, Esq.	8	0 6	12 T	30·44	207
†Dover (Russell Street)	H. J. Poulter, Esq.	5	2 2	30 ?	30·27	145
†Cranbrook (Hartley)	G. Pile, Jun. Esq.	5	4 0	407	26·89	209
† „ (Tillsden)	T. Pile, Esq.	...	0 4	305	29·16	...
Goudhurst Vicarage	Rev. J. S. Clarke	5	1 1	419 ⅄	23·74	159
Edenbridge (Falconhurst Court)	J. G.Talbot, Esq., M.P.	5	1 0	400 L	28·42	162
†Maidstone (Linton Park)	Mr. J. Robson	8	0 6	296 ⅄	25·12	167
† „ (East Sutton Park)	Mr. T. Skinner	8	0 6	387 T	22·27	...
† „ (Hunton Court)	Mr.P. Goddard	8	0 6	80 T	22·94	129
Charing (Otterden)	Rev. W. A. Paxton	5	1 0	507 ⅄	26·76	...
Canterbury (Bridge Street)	Mr. J. Reid	5	1 0	52 T	23·30	171
Faversham	S. T. Harris, Esq.	5	2 0	40?	23·44	115
† „ (Brogdale)	W. C. Stunt, Esq.	5	0 10	140 T	22·40	147
†Sandwich (Walton House,Eastry)	Colonel Rae	5	1 0	53 T	21·84	...
†Maidstone (Somerfield)	F. H. Holmes, Esq.	20	1 5	...	24·85	...
„ (Boxley Road)	J. Case, Esq.	5	1 0	170 T	23·85	152

DIVISION II.—SOUTH-EASTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter	Height Above Ground. ft.	in.	Height Above Sea Level	Depth of Rain. 1871	Days on which 01 or more fell.
KENT—(*con*).					feet.	inches.	
Seven Oaks (River Hill)	J. T. Rogers, Esq.	8	3	6	526 T	27·23	112
„ (Riverhead Vic.)	Rev. J. B. Murdoch	5	1	0	...	30·52	170
†Westerham (Chartwell)	A. C. Colquhoun, Esq.	5	0	6	500 ?	26·18	...
Selling (Harefield)	E. Neame, Esq.	5	2	6	217 T	25·31	167
†Margate (Acol)	E. S. Lendon, Esq.	5	1	0	60 T	19·75	...
„ (Cecil Square)	W. Lane Sear, Esq. C.E.	5	6	0	35 R	23·23	140
Sittingbourne	G. Payne, Junr., Esq.	5	1	1	38	21·57	...
†Bromley Common, S.E.	Rev. A. Rawson	8	1	0	250 T	26·00	164
†Chislehurst (Heathfield Lodge)	F. Nunes, Esq.	8	1	0	295 T	23·31	177
† „ („ „)	„ „ „	5	2	0	296 T	22·79	161
„ („ „)	„ „ „	5	1	0	296 T	22·26	...
†Foot's Cray (Sidcup)	Miss Berens	5	0	8	231 T	23·35	...
†Beckenham (Parkside)	C. O. F. Cator, Esq.	8	0	3	142 R	24·14	154
† „ „ *monthly*	„ „	5	0	4	142 R	22·75	...
† „ „	„ „	5	50	0	200 R	18·75	141
† „ (Foxgrove)	Percy Bicknell, Esq.	5	0	5	141 R	23·66	148
† „ „	„ „	5	4	0	145 R	22·97	143
Forest Hill (Church Road)	Edwin E. Glyde, Esq.	5	1	0	90 T	22·35	167
Dartford (The Downs)	R. F. Jarvis, Esq.	5	2	0	250 T	20·78	114
†Eltham Green	Mr. E. J. C. Smith	5	1	0	76 T	23·46	161
Lee (Blessington Road)	J. Grant, Esq., C.E.	10	4	9	49	23·76	...
Greenwich (Royal Observatory)	J. Glaisher, Esq., F.R.S.	8	0	5	155 T	22·30	...
Deptford (Pumping Station)	W. Jeffree, Esq.	10	3	8	18 R	25·02	148
Erith (Crossness)	F. E. Houghton, Esq.	11	0	6	16 R	24·41	154
„ „	„ „ „	11	0	6	24 R	25·33	154
WEST SUSSEX.							
†Bognor (Aldwick)	H. Upton, Esq.	5	1	0	50 T	25·24	...
†Worthing (Bedford Rw.) (*monthly*)	W. J. Harris, Esq.	5	1	0	18 R	24·45	...
„ „	„ „ „	8	0	6	17 R	23·68	143
„ (Water Works)	„ „ „	5	0	11	25 R	25·13	126
†Arundel (Yapton)	R. Redford, Esq.	5	1	0	23 R	26·22	149
West Thorney [Emsworth]	F. Padwick, Esq.	5	0	8	10 ?	26·19	118
†Chichester (Infirmary = Museum)	W. Hills, Esq.	5	0	6	50 T	25·86	...
† „ (Westgate)	Dr. Tyacke	5	0	6	40 T	24·86	...
† „ (Shopwyke)	Rev. G. H. Woods	8	1	2	61 T	26·19	...
†Arundel (Dale Park)	J. C. Fletcher, Esq.	11	3	5	316 T	29·87	91
†Steyning	Rev. Hugh Ingram	5	1	0	80 T	35·46	147
†Chichester (West Dean)	H. Paxton, Esq.	8	1	6	209 R	34·39	161
† „ (Chilgrove)	John W. Woods, Esq.	5	0	6	284 T	33·19	...
† „ (Bepton Hill)	„ „ „	5	0	6	554 T	37·39	...
†Petworth Rectory	Rev. C. Holland	5	2	0	190 R	27·60	127
†Horsham (Leonardslee)	Mr. Ford	5	1	6	273 T	25·30	...
Midhurst (Lynch)	J. Eames, Esq.	6	0	6	160 ?	37·72	...
†Fernhurst [Haslemere]	Miss E. A. Salvin	8	0	10	301	27·36	...
Milland House [Liphook]	Rev. J. M. Heath	18	30	0	350	31·20	...

DIVISION II.—SOUTH-EASTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
EAST SUSSEX.						
†Beachy Head	Miss W. L. Hall	5	1 0	610 T	21·82	...
Eastbourne	„ „ „	5	4 0	12 L	25·60	161
„ (Cemetery)	„ „ „	5	4 0	160 ?	26·93	155
†Pevensey	M. Vidler, Esq., C.E.	8	4 0	10 T	19·72	146
Brighton (Cambridge Rd., Hove)	H. B. Peake, Esq.	5	1 0	111 ⅄	24·30	...
„ (Buckingham Place)	F. E. Sawyer, Esq.	5	0 8	200 ⅄	25·25	161
† „ (St. James' St.)	E. Rowley, Esq.	5	1 0	37 ⅄	25·56	152
† „ (Eaton Place)	Dr. Barker	8	0 3	98 ⅄	25·49	147
† „ (W. W. Lewes Road)	Brighton Water Co.	5	0 7	90 ⅄	27·32	...
„ (W. W. Goldstone Bot)	„ „ „	5	...	140 ⅄	26·11	...
†Hastings (High Wickham)	E. Field, Esq.	5	2 0	212 B	26·74	...
† „ (Bleak House)	Mr. J. Banks	8	1 3	77 ⅄	22·09	130
„ (The Hollies)	A. H. Wood, Esq.	8	2 0	100 ⅄	23·51	...
† „ (Cemetery)	Mr. Field	5	0 6	500 T	24·49	148
† „ (Hollington)	Capt. Lewis	5	1 0	315 B	25·58	154
†Lewes (Glynde Place)	Mr. J. McLeod	5	2 9	59 T	31·36	130
†Battle	F. Webster, Esq.	5	1 3	...	26·16	...
Framfield (The Grange)	Capt. T. G. Drake, R.N.	8	1 2	255 B	26·92	...
†Uckfield Observatory	C. L. Prince, Esq.	12	6 0	149 ⅄	25·64	131
†Newick (Ketches)	Miss I. Shiffner	8	0 5	192 T	26·25	154
†Maresfield (Forest Lodge)	Captain W. Noble	8	1 2	259 T	30·45	159
†Hayward's Heath (Asylum)	Rev. T. E. Crallan	5	1 0	250 T	24·81	163
Crowborough Beacon Observatory	C. L. Prince, Esq.	8	0 6	777 ⅄	32·12	...
Cuckfield (Balcombe Place)	J. A. Hankey, Esq.	8	1 3	300 B	29·29	158
East Grinstead	W. V. K. Stenning, Esq.	5	1 3	356 ⅄	28·76	157
HAMPSHIRE.						
†Isle of Wight (Niton)	Rev. R. C. Kempe	8	0 4	100 T	26·14	...
† „ „ (St. Lawrence)	Rev. C. Malden	5	1 0	75 ⅄	26·13	142
† „ „ (Ventnor)	Dr. Martin	12	3 0	150 ⅄	24·91	135
„ „ (Newport)	Mr. E. G. Aldridge	5	12 9	57 ⅄	32·13	145
† „ „ (Ryde)	R. Taylor, Esq.	12	7 0	20 ⅄	29·14	132
† „ „ (Osborne)	J. R. Mann, Esq.	8	0 8	172 ⅄	29·26	148
Christchurch (Carbery)	F. Moser, Esq.	8	0 8	98 ⅄	29·38	150
Lymington (Wainsford)	H. Fawcett, Esq.	5	1 0	58 ⅄	27·03	143
Southampton (Cadland)	A. H. Hogg, Esq.	8	5 0	50?	33·35	157
Fareham	H. Sharland, Esq.	5	10 0	36	29·07	...
Havant (Bedhampton)	J. N. Hillman, Esq.	5	4 0	...	28·60	165
„ (Leigh Park)	W. H. Stone, Esq., M.P.	8	0 9	120 T	30·29	130
Southampton, Ordnance Survey Office	Col. Sir H. James, R.E. F.R.S.	5	0 4	74 ⅄	29·68	146
		5	1 0	75 ⅄	30·01	145
„ „ „	„ „ „ „	14	18 6	92 ⅄	26·35	144
Southampton (Woolston Lodge)	F. Ekless, Esq.	5	1 2	90	28·89	...
„ (Eling House)	W. C. Spooner, Esq.	5	1 0	20	30·71	...
„ (Shirley Warren)	R. C. Hankinson, Esq.	5	4 0	106	29·25	160
Botley (Morehill, Shedfield)	Adl. Sir T. S. Pasley, Bt.	8	5 0	160 ⅄	32·36	158
Bishop's Waltham (Swanmore Ho)	B. P. Shearer, Esq.	5	0 4	390 T	32·97	130
Winchester (Otterbourne) *daily*	J. B. Yonge, Esq.	5	1 3	115 T	29·34	123
Petersfield (Liss)	G. E. Coryton, Esq.	7	0 7	250 ⅄	34·72	...

DIVISION II.—SOUTH-EASTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge: Diameter.	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
HANTS—(*con.*)						
Alresford (Arle Bury)	F. Marx, Esq.	4	1 6	308 ⅄	31·10	128
Alton (E. Tisted Rectory)	Rev. F. Howlett	5	1 1	450	34·79	...
Selborne (The Wakes)	T. Bell, Esq.	6	4 0	400 T	33·43	138
Aldershot	Mr. J. Arnold	8	0 6	325	26·93	168
„ (Bourley—2 miles W.)	„ „ „	8	1 0	370	25·76	154
Basingstoke (Chapel Hill)	G. Stephens, Esq.	5	1 0	328 T	26·47	163
„ „ „ *monthly*	„ „ „	5	0 9	328 T	26·50	...
Rotherwick (Tylney Hall)	C. E. Harris, Esq.	5	1 0	300 B	24·87	...
†Basingstoke (Sherborne St. John)	Rev. D. W. Chute	5	1 2	276 T	26·34	135
† „ (The Vyne)	W. Wiggett Chute, Esq.	8	1 2	236 T	24·57	136
† „ „ „	„ „ „	3	1 2	236 T	25·59	136
Hartley House	Rev. J. Keate, M.A.	8	1 0	233 B	24·26	...
†Strathfield Turgiss	Rev. C. H. Griffith	5	3 0	200 ⅄	22·11	128
Heckfield (Park Corner)	J. Martineau, Esq.	5	1 4	257 B	21·88	...
†Strathfieldsaye	Mr. J. Bell	8	1 0	160 T	23·21	126
BERKS.						
Sunningdale (Lynwood)	Admiral Sir F. W. Grey	8	0 9	264 ⅄	24·01	145
†Reading (Englefield)	E. Robinson, Esq.	5	1 0	190 B	22·14	122
† „ (Russell Street)	Dr. Workman	5	2 8	59	20·96	147
Newbury (Greenham)	Comm. J. Ward, R.N.	5	1 0	235?	24·89	153
„ (Welford Park)	Mr. C. Ross	5	0 11	335 ⅄	26·73	160
Maidenhead (Kimber Cottage)	Mr. J. Silver	8	1 2	93 ⅄	19·76	...
Streatley Vicarage	Rev. J. Slatter	10	0 4	150 ⅄	21·40	138
Maidenhead (Cookham Vic.)	Rev. R. W. Rogers	5	1 3	70?	21·22	164
„ (The Halls, Cookham)	F. W. E. Jowers, Esq.	5	1 6	70?	21·56	177
Shrivenham (Ashbury Vic.)	Rev. H. Miller	5	1 0	479 ⅄	25·92	150
*Wantage	E. C. Davey, Esq.	5	12 8	320	23·80	122
Wallingford (The Castle)	J. Kirby Hedges, Esq.	5	0 9	175 ⅄	20·98	113
Long Wittenham	Rev. J. C. Clutterbuck	12	1 0	170 ⅄	21·52	...
Abingdon	W. Belcher, Esq.	5	1 0	180 T	20·46	128

DIVISION III.—SOUTH MIDLAND COUNTIES.

HERTS.							
Watford (Oaklands)	E. Harrison, Esq.	5	5	6	283	25·17	179
Hoddesdon (Field's Weir)	N. Beardmore, Esq. C.E.	24	2	0	82	22·10	131
Bayfordbury	W. C. Baker, Esq.	8	0	4	250	23·42	128
St. Albans (Gorhambury)	Mr. G. Bogue	6	2	9	...	24·43	137
Hemelhempstead (Nash Mills)	J. Dickinson & Co.	12	3	0	250 L	23·49	159
Berkhampstead	W. Squire, Esq.	8	1	6	370 B	25·36	...
Tring (Cowroast)	H. Thomas, Esq.	10	4	2	345	23·69	134
Kensworth [Dunstable]	T. Jones, Esq.	5	1	0	902 ⅄	24·89	107
Ware (Much Hadham)	Rev. H. S. Mott	5	1	0	222 B	22·86	154
Stevenage	Rev. J. O. Seager	8	4	2	321 L	21·98	158
Buntingford (Aspenden Rectory)	Rev. A. P. Sanderson	5	1	1	329 T	23·07	134
Hitchin	W. Lucas, Esq.	8	1	4	238 ⅄	20·84	185
Royston	H. Wortham, Esq.	8	0	6	266 ⅄	19·07	138

DIVISION III.—SOUTH MIDLAND COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
BUCKINGHAMSHIRE.						
Eton College	Rev. Herbert Snow	5	1 0	72 ⅄	20·09	130
High Wycombe	H. S. Wheeler, Esq.	8	0 9	225 T	20·94	...
Great Missenden	J. Begbie, Esq.	6	1 0	...	25·91	...
Wendover (Cholesbury)	Rev. H. P. Jeston	5	4 0	800?	25·23	...
Aylesbury	J. Copcutt, Esq., C.E.	12	1 0	...	21·79	67
Winslow (Addington Manor)	Egerton Hubbard, Esq.	...	1 0	...	23·01	100
Newport Pagnell	R. Littleboy, Esq.	5	2 0	...	22·55	...
OXFORD.						
Henley-on-Thames	T. F. A. Byles, Esq.	5	4 0	91 B	23·38	...
Watlington (Swyncombe House)	Mrs. Ruck Keene	5	0 4	750?	22·85	...
Thame (Aston Rowant)	T. Taylor, Esq.	8	1 0	390 B	22·41	...
Oxford (Magd. Col. Laboratory)	E. Chapman, Esq., M.A.	5	0 8	195 ⅄	20·70	129
„ (Radcliffe Observatory)	Rev. R. Main, F.R.S.	10	0 8	207 ⅄	21·14	137
„ „	„ „ „	10	22 0	229 ⅄	20·41	...
„ „	„ „ „	10	112 0	319 ⅄	13·59	...
Enstone (Chadlington)	W. Searle, Esq.	4	4 0	700	24·12	115
„ (Upper Heyford)	Rev. C. B. Mount	9	1 2	324 T	22·63	128
*Bicester (Stratton Audley Pk)	G. Glen, Esq.	5	2 5	295?	21·17	...
Chipping Norton (Kingham)	Rev. J. W. Lockwood.	5	3 6	442	25·56	...
Banbury (Broughton Lodge)	E. C. Morrell, Esq.	5	2 0	360?	24·65	146
„ (High Street)	T. Beesley, Esq.	6	7 0	350	24·80	158
NORTHAMPTON.						
Potterspury [Stony Stratford]	Rev. R. E. Crawley	5	0 4	...	19·53	155
Thorpe Mandeville [Banbury]	Rev. W. L. Browning	5	0 5	580	24·88	147
Weedon Beck Vicarage	Rev. J. S. Winter	8	1 6	280 T	22·34	...
Northampton	H. Terry, Esq.	5	5 0	...	20·94	154
„ (Gold Street)	S. Law, Esq.	5	6 0	230 ⅄	21·33	165
„ (Thorpelands)	H. J. Little, Esq.	8	0 6	280?	21·78	117
„ (Althorp House)	Mr. W. F. Jakeman	8	3 4	310 ⅄	22·43	136
Wellingborough	E. Sharman, Esq.	5	0 3	...	20·17	149
Kettering	J. Wallis, Esq.	8	1 3	300 B	22·02	175
Rockingham Castle	Mr. J. Brown	5	1 3	400	23·58	...
Easton [Stamford]	C. Day, Esq.	5	0 10	220?	22·64	159
HUNTS.						
St. Neots, (Tetworth Hall)	Miss Kaye	5	0 6	214 T	21·43	135
„ (Waresley)	Rev. W. M. H. Elwyn	8	1 0	193 ⅄	20·47	141
Kimbolton (Hamerton)	Rev. A. F. Stopford	10	5 4	170	21·73	...
*Huntingdon (Wistow)	Rev. T. Woodruff	5	1 2	...	21·03	...
Conington Castle	J. M. Heathcote, Esq.	5	1 0	...	21·97	...
BEDFORD.						
Woburn (Lindon)	Mr. Clarke	5	2 0	...	22·33	108
Stotfold [Baldock]	W. Denne, Esq.	5	0 9	220	19·88	130
Aspley Guise (Hayfield House)	S. Douglas, Esq.	5	1 1	...	23·04	120
Ampthill	W. S. Slinn, Esq.	5	1 1	320	22·10	98

DIVISION III.—SOUTH MIDLAND COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	in.	Height Above Sea Level feet.	Depth of Rain. 1871 inches.	Days on which ·01 or more fell.
BEDFORD—(*con.*)							
Biggleswade	C. T. Newbery, Esq	5	28	0	...	20·48	...
Sandy Vicarage	Rev. J. Richardson	5	0	7	...	21·75	141
Cardington	Mr. J. B. McLaren	8	0	0	106	21·20	...
„ (Staff gauge)	„ „ „	12	3	6	109	19·69	133
„	„ „ „	8	36	0	142	16·53	...
Bedford	D. Robie, Esq.	8	1	0	85	19·94	126
CAMBRIDGE.							
Abington Pigotts [Royston]	G. Pigott, Esq.	8	0	6	130 B	20·49	159
Pampesford Hall	Mr. A. McIntyre	5	1	0	134 ⅄	18·60	...
Granchester Mill	J. Nutter, Esq.	5	4	0	31 ⅄	20·42	169
Cambridge W. W. (Cherryhinton)	H. Tomlison, Esq., C.E.	5	0	6	...	18·90	153
„ (Beech House)	J. Nutter, Esq.	8	4	0	40 ⅄	19·20	167
„ (Merton Villa)	G. Warren, Esq.	5	1	0	40 B	19·87	154
„ (Sidney Street)	Mr. W. E. Paine	8	51	0	83 ⅄	18·68	...
* „ (Observatory)	Professor Adams, F.R.S.	5	0	9	88 ⅄	19·12	121
Ely (Stretham)	Mr. Edwin Stanley	9	4	9	...	20·33	115
Standground Sluice, [Peterboro']	R. Lunn, Esq.	...	...		...	20·94	125
Wisbech (Harecroft Ho.)	A. Peckover, Esq.	8	0	8	11 T	24·77	128
„ (Observatory)	S. H. Miller, Esq.	8	0	6	10 T	24·82	151
„ „ (*monthly*)	„ „ „	5	0	6	10 T	24·26	...
„ „	„ „ „	8	8	0	18 T	23·90	151
„ „	„ „ „	20x10	35	0	45 T	19·87	...

DIVISION IV.—EASTERN COUNTIES.

ESSEX.							
Barking	F. H. Parsons, Esq., MD.	5	1	5	...	20·48	81
Shoeburyness	Capt. Fairford Ellis, RA	5	4	0	12?	20·43	157
Rochford (Clement's Hall)	A. Holt White, Esq.	8	4	0	32 T	20·66	129
Brentwood (Sawyer's Hall Farm)	Rogers Field, Esq., C.E.	5	1	0	250?	23·57	118
Maldon (Purleigh)	Rev. G. F. Tamplin	5	4	6	...	20·95	172
Waltham Abbey	The Superintendent	8	4	0	83?	20·96	...
Epping (The Hemnalls)	J. Nicholl, Esq.	8	0	8	345 T	23·79	156
Chelmsford	F. Chancellor, Esq.	8	1	0	86 T	21·41	...
Harlow (Sheering)	Rev. Edward Hill	5	1	0	214 T	22·90	194
„ (Moor Hall)	Mr. Huntley	8	1	6	220 ⅄	22·25	171
Witham (Dorward's Hall)	H. Dixon, Esq.	6	1	6	20?	20·77	...
Dunmow (High Roding)	Rev. E. Maxwell	5	0	8	252 T	22·85	160
„	H. E. Cockayne, Esq.	12	0	0	234 ⅄	21·66	140
*Colchester (Birch Hall)	Mr. W. Ingle	5	1	0	80	21·88	136
„ (The Camp)	Sergeant Sheehan	8	1	0	109 ⅄	21·22	133
Braintree (Bocking)	S. Tabor, Esq.	12	3	6	200 T	22·73	127
Manningtree (Wix)	R. Field, Esq., C.E.	5	1	0	80?	20·84	...
Harwich (Ramsey)	J. Brampton, Esq.	5	1	0	100 ⅄	22·04	124
Saffron Waldon (Wimbish)	Mrs. Emson	8	0	6	...	21·79	98
„ „ (Ashdon)	Rev. J. T. Walker	5	1	0	300 ⅄	21·46	...
„ „ (Audley End)	Mr. J. Bryan	5	1	0	163 ⅄	19·99	165

DIVISION IV.—EASTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	Height Above Sea Level feet.	Dep h of Ra n. 1871 inches.	Days on which ·01 or more fell
SUFFOLK.						
Nayland (Tendring Hall)	Mr.G. L. Rushmore	8	0 8	...	21·55	109
Hadleigh (Boxford)	Rev. J. Byng	8	1 2	...	22·81	162
Sudbury	J. Alexander, Esq.	5	3 10	116 B	21·66	157
Hadleigh (Aldham)	T. F. Lloyd, Esq.	5	2 6	...	21·83	147
Grundisburgh	P. Harris, Esq.	5	3 6	...	21·71	162
Saxmundham (Carlton Hall)	Mr. Clark	8	5 0	...	22·72	161
Bury St. Edmunds (Drinkstone Pk)	Mr. Nichol	8	1 2	250	24·77	135
† „ „ (Abbeygate St.)	T. C. Hinnell, Esq.	6	35 0	...	19·55	129
Stowmarket (Wetherden Rec.)	Rev. C. J. Goodhart	8	0 6	175 T	21·13	160
† Bury St. Edmunds (Beech Hill)	H. Turner, Esq.	6	0 9	...	25·44	71
† „ „ (Westley)	R. Burrell, Esq.	5	1 0	...	22·80	...
† „ „ (Barton Hall)	Mr. W. Allan	5	1 0	...	22·61	122
† „ „ (Culford)	Mr. P. Grieve	5	1 2	...	24·78	141
† Ixworth	Rev. W. Steggall	5	1 7	...	24·65	160
† „ (Walsham-le-Willows)	Miss Martineau	5	0 11	...	24·39	167
† „ (Barningham)	J. Fison, Esq.	8	0 10	...	20·99	...
† Eye (Yaxley)	Rev. W. H. Sewell	8	1 0	199	22·54	163
† Lowestoft (Gisleham)	Rev. H. Jodrell	5	1 2	36 T	21·98	...
† „ (Carlton Colville)	G. Edwards, Esq. C.E.	8	0 9	6 T	23·35	...
† „ (Somerleyton Hall)	Mr. Rix	8	3 0	60	21·47	143
† „ („ Rectory)	Rev. C. J. Steward	8	1 0	50	23·44	156
NORFOLK.						
Diss	T. E. Amyot, Esq., M.D.	5	1 0	96	23·10	174
† „ (Dickleburgh)	Francis Dix	8	3 6	120 L	21·85	114
† Geldeston [Beccles]	E. T. Dowson, Esq.	5	1 0	40 B	22·18	160
† West Tofts [Brandon]	Mr. R. Martin	5	1 0	91 T	22·59	160
Hingham	Rev. J. M. Du Port	...	...	...	23·97	...
„ (Hardingham)	„ „ „	...	...	...	28·56	...
Stoke Ferry (Wereham)	Mr F. R. Hawkes-Mason	5	6 0	...	20·03	132
Downham Market (Outwell Sluice)	R. Lunn, Esq.	...	4 0	16	18·37	129
* „ (Bexwell)	Rev. E. J. Howman	5	0 11	...	22·71	131
„ (Fincham)	Rev. W. Blyth	3	4 0	100	23·14	...
Swaffham (Pickenham Hall)	E. A. Applewhaite, Esq	5	1 0	160 ?	23·09	159
Yarmouth (Halvergate Hall)	Miss Gillett	5	3 3	49 T	24·33	129
Norwich (Postwick)	Rev. J. M. Du Port	...	...	...	24·50	...
† „ (St. Catherine's Close)	Mrs. Evans	5	2 3	120	25·34	158
„ (Literary Institution)	The Secretary	12	30 0	53 T	23·13	128
† „ (Thorpe)	W. Birkbeck, Esq.	5	1 0	137 T	26·31	166
Acle (Lingwood)	Miss Burroughes	5	2 6	...	26·03	159
† „ (Rectory)	Rev. R. W. Kennion	8	0 9	40 T	22·56	134
† Filby	Mr. Crisp	5	2 4	11	22·38	116
Norwich (Eaton)	J. Pymar, Esq.	6	1 0	...	24·80	..
„ (Cossey)	H. Culley, Esq.	5	1 0	...	24·02	158
† „ (Honingham Hall)	Lady Bayning	5	0 6	88	24·56	170
„ (Honingham)	Rev. J. M. Du Port	...	...	90	24·42	172
† Dereham (Mattishall)	„ „ „	8	1 2	165 T	24·91	178
† „ (Hockering)	„ „ „	8	1 3	140 T	25·04	161
* Swaffham (Grammar School)	C. J. Drury, Esq.	5	1 10	239 T	23·63	162

DIVISION IV.—EASTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
NORFOLK—(*cont.*)						
†East Dereham	G. H. Cooper, Esq. ...	8	3 0	161 T	25·12	...
„ „	Mr. W. T. Gidney	3	4 0	160	21·80	148
Swaffham (Dunham)	Rev. J. M. Du Port ...	...	...	...	25·90	175
*Reepham	T. Alderton, Esq.	5	1 0	...	23·95	148
Cawston	Rev. T. H. Marsh	...	...	...	25·05	190
North Walsham (Worstead)	Mrs. Cooke	5	0 10	...	24·55	175
Lynn (Hillington Rectory)	Rev. H. Ffolkes	5	4 0	90 ⅄	22·70	149
Fakenham (Egmere)	R. Overman, Esq.	4	4 8	150	24·47	141
Burnham (Westgate)	W. H. Spencer, Esq ...	3	5 10	13	21·31	127
Holkham	J. Davidson, Esq. ...	8	0 0	39 L	22·28	...
„	„ „ „	12	4 0	43 L	21·01	110
Wells	H. R. Rump, Esq.	5	1 0	16 T	22·77	177
Hunstanton	Mr. Monument	11	3 8	60 ⅄	21·45	82

DIVISION V.—SOUTH-WESTERN COUNTIES.

WILTS.						
Landford	J. R. Wigram, Esq. ...	5	1 5	160 T	29·73	160
Salisbury (Alderbury)	Rev. R. S. Hutchings..	5	0 8	250 ?	27·62	153
„ (West Dean)	Rev. W. L. W. Eyre...	5	1 0	139 B	27·61	134
„ (Wilton House)	Mr. Challis	8	0 5	150 ⅄	31·66	150
„ (Woodford)	H. Hinxman, Esq.	5	1 2	150 ⅄	28·74	...
Salisbury Plain (Chiltern Ho.)	R. Hayward, jun., Esq.	11	4 0	380 ?	28·06	160
„ „ (Orcheston)	Rev. J. Wardale	6	0 8	240 B	24·25	125
„ „ (Imber)	Rev. W. Slatter	5	4 0	400 ?	28·06	138
Ludgershall [Andover]	E. G. Fawcett, Esq.	8	1 4	422 ⅄	29·99	151
Trowbridge (Sunny Side)	W. J. Mann, Esq.	5	1 1	190 T	29·88	140
Bradford (Monkton Farleigh)	R. W. Caldwell, Esq..	...	...	...	31·64	...
Chippenham (Lacock)	D. E. Boorman, Esq...	5	1 0	...	26·79	...
Marlborough College	Rev. T. A. Preston	5	0 0	456 T	30·46	159
„ (Mildenhall)	Rev. C. Soames	5	1 0	464 T	28·13	154
Chippenham (Tytherton)	Major Gritton	5	1 2	150 ?	26·93	184
Swindon (Draycot Foliatt)	T. Arkell, Jun., Esq.	5	1 0	...	29·09	155
„ (Penhill)	T. Arkell, Esq.	5	0 10	400 ?	28·14	147
Thames' Head [Cirencester]	J.H.Taunton, Esq., C.E.	8	4 0	350 ⅄	30·67	158
DORSET.						
Kimmeridge	J.Mansel-Pleydell, Esq	5	0 4	90	31·57	138
Corfe Castle (West Bucknowle)..	W. J. Voss, Esq.	5	4 6	160 L	32·42	105
Weymouth (Osmington Lodge)..	Captain Hall	5	1 0	150 ?	34·45	155
Upwey	J. Miller, Esq.	5	1 0	70	32·27	157
*Dorchester	J. Jowett, Esq.	5	0 6	250 T	40·49	164
Lyme Regis	H. Tucker, Esq.	5	4 6	146 B	34·63	166
Bridport	A. Stephens, Esq.	8	0 8	60 B	30·84	147
„ *monthly*	„ „	8	...	45 B	30·26	...
„ (Hill Side)	J. Stephens, Esq.	8	0 10	60	30·98	154
Maiden Newton (Frome Vanchr.)	Rev. P. H. Newnham..	5	0 3	325 B	37·82	187
Blandford (Longthorns)	J.Mansel-Pleydell, Esq	5	0 4	340 B	37·49	157

DIVISION V.—SOUTH-WESTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground ft.	in.	Height Above Sea Level feet	Depth of Rain. 1871 inches.	Days on which ·01 or more fell.
DORSET—(*con.*)							
Blandford (Whatcombe)	J. Mansel-Pleydell, Esq.	5	0	4	300	38·88	62
„ (Bingham's Melcombe)	Rev. C. W. Bingham...	5	1	3	300 ?	39·07	150
Cerne Abbas (Melbury).....	Mr. T. C. Elliott	12	2	9	...	43·52	257
*Wimborne Minster (Chalbury)...	Rev. G. H. Billington.	5	2	0	338 ⅄	31·87	154
Blandford.....	W. Shipp, Esq.	5	1	0	...	34·23	...
Shaftesbury.....	T. Ackland, Esq.	5	1	1	416 B	29·51	137
DEVON.							
†Kingsbridge (Bolt Tail) .....(58)	W. Balkwill, Esq.....	5	2	0	297 L	38·39	...
† „ (Burton)..... (57)	„ „ „	5	1	0	200 L	35·36	...
† „ (Fore St. Hill) (56)	G. Fox, Esq.	5	0	6	68 B	43·30	166
†Plymouth (Old Town St.) ...(52)	A. P. Balkwill, Esq....	5	35	0	150	40·50	...
† „ (Navigation School)...	J. Merrifield, Esq.....	8	26	6	100 ⅄	35·87	167
„ (Drake's Reservoir) ...	G. D. Bellamy, Esq....	5	0	6	140	40·99	176
† „ (Saltram Gardens)(51)	Mr. J. Snow	5	0	3	96 T	46·88	...
† „ (Ham) .....(53)	Rev. C. T. C. Trelawny	5	3	0	94 ⅄	45·75	137
†Ivybridge .....(49)	Dr. Liddell.....	10	3	0	175 B	47·49	...
†Brixham (Lupton) .....(48)	Mr. G. Erskine.....	12	3	6	200	44·63	149
†PlymptonStMary(Ridgew'y)(50)	Miss B. T. Phillipps ...	5	0	6	116 ⅄	47·72	179
„ „ (Hemerdon)...	Rev. G. L. Woollcombe	5	0	6	...	52·81	...
Totness (Dart View) .....(45)	E. Windeatt, Esq.....	5	1	0	120	48·41	186
BA†Torquay (Lamorna) .....(43)	W. Pengelly, Esq, F.R.S	5	0	9	200 ⅄	36·72	179
†Dartmoor (Lee Moor) .....(44)	W. L. Martin, Esq. ...	5	0	5	860 ⅄	70·65	...
† „ (Redstone, Sheepstor)(41)	G. D. Bellamy, Esq....	5	1	0	800	56·21	133
„ (Holne Vicarage) ...(33)	Rev. J. Gill.....	5	1	0	...	70·05	219
†Ashburton (Druid House) ...(32)	Fabyan Amery, Esq...	5	1	0	570 T	52·15	186
†Dartmoor (Prison Reservoir)(34)	Mr. H. Watts	5	0	2	1400	69·38	226
„ („ Garden)	„ „ „	5	1	0	1350 ⅄	79·36	226
„ (Rundlestone).....(35)	„ „ „	5	1	0	1500?	74·04	226
†Teignmouth (Landscore).....(29)	Mrs. Clark	5	0	3	125 T	36·57	...
„ (Brookbank) .....(66)	G. W. Ormerod, Esq..	5	1	2	74 L	35·91	173
†Ilsington (Middlecott Ho.)...(23)	Alfred Lyon, Esq.....	9	3	6	639 T	41·32	163
†Tavistock (Public Library) (38)	Mr. W. Merrifield.	8	20	0	283 T	51·88	149
† „ (West Street) .....(38)	T. Windeatt, Esq.....	1	4	6	286 T	53·40	...
†* „ (Mount Tavy).....(37)	H. Clark, Esq.	5	1	0	316 T	50·47	...
BA „ (Kilworthy Hill) (67)	W. Merrifield, Esq. ...	5	1	0	434 T	48·79	141
Dartmoor (Widdecombe Vic.)(24)	Rev. J. Williams	5	1	0	810 T	59·87	...
†Milton Abbot (Endsleigh) ...(26)	Mr. Cornelius.....	5	1	0	180 ?	51·51	...
†Bovey Tracey .....(22)	J. Divett, Esq.	5	0	6	92 ⅄	40·97	177
†Coryton Lew Down.....(21)	Mr. T. Symons	12	6	0	445	46·93	186
†Exmouth (Budleigh Salterton)...	R. Walker, Esq.....	5	4	0	33	31·74	158
Polapit, Tamar [Launceston] ...	E. Coode, Esq.	...	3	0	...	38·53	149
†Chagford .....(20)	R. L. Berry, Esq.	5	0	7	575 B	45·07	...
Sidmouth.....	W. Strahan, Esq.	...	1	0	25	31·80	...
„ (Belgrave)	Dr. Mackenzie	5	0	6	26 ⅄	29·78	161
„	S. Chick, Esq.	10	25	0	43 ⅄	23·58	146
„ (Sidmount)....	Dr. Radford	5	1	0	149 ⅄	31·26	153
„ („)	„ „ „	5	8	6	195 ⅄	29·40	...
Seaton (White Cliff Glen).....	T. F. A. Byles, Esq....	5	2	0	125	32·34	...

DIVISION V.—SOUTH-WESTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	in.	Height Above Sea Level feet.	Depth of Rain. 1871 inches.	Days on which '01 or more fell.
DEVON—(*con.*)							
Clevelands [Lyme Regis]	E. L. Ames, Esq.	5	1	6	450?	35·25	158
†Topsham (Clyst St. George)	Rev. H. T. Ellacombe.	5	1	3	76 T	31·36	...
†Exeter (High Street) .....(17)	W. H. Ellis, Esq.	5	47	11	184 ⅄	31·93	155
† „ „ „	„ „	10	44	3	180 ⅄	31·49	158
† „(Devon & Exeter Institution)	Mr. E. Parfitt	6	13	7	155 ⅄	32·50	140
† „ (Manston Terrace)... (18)	Miss Dymond.....	5	0	1	165 T	31·57	148
Honiton (Gittisham)	C. Hardy, Esq.	5	1	0	...	38·25	158
Okehampton (Oaklands).....(19)	W. H. Holley, Esq. ...	5	1	0	500	45·68	212
Hatherleigh (North Lew) ... (15)	Rev. T. England	5	1	10	...	42·10	178
ℬ Holsworthy (Clawton) ... (16)	W. W. Melhuish, Esq.	5	1	1	300?	34·14	149
Hatherleigh(Jacobstowe) ... (14)	Dr. Madden	8	1	2	340 B	37·65	185
†Exeter (Brampford Speke)...(13)	W. H. Gamlen, Esq....	5	1	0	140 T	34·24	201
† „ „ „ (*monthly*)(13)	„ „ „ ...	8	0	2	140 T	34·42	...
Zeal Monachorum .....(63)	Rev.H. J. A. Fothergill	5	0	9	600	41·10	164
Cullompton (Clyst Hydon)	Rev. J. Huyshe.....	...	1	0	200 ⅄	32·21	...
„ (Strath Culm)	C. R. Collins, Esq.....	8	0	6	159	27·90	90
„ (Bradninch)	H. Matthew, Esq.....	12	1	6	234	33·10	...
†Honiton (Broadhembury)	Rev. W. Heberden ...	5	1	6	400 T	34·38	173
Tiverton (Cove) .....(9)	W. N. Row, Esq.	11	0	4	400?	39·72	...
„ (Springfield)	H. Stokes, Esq.....	6	0	3	300?	?36·97	190
Chulmleigh (Witheridge).....(8)	Rev. J. P. Benson.....	...	...		...	33·16	149
Great Torrington .....(61)	Rev. S. Buckland	5	1	1	321 L	37·79	173
S. Molton (Meshaw) .....(62)	Rev. W. H. Karslake	8	0	6	472 L	37·60	183
„ (Rose Ash) .....(60)	Captain Davy.....	8	0	6	650	38·25	...
Bampton .....(6)	J. Edwards, Esq.	5	1	0	460	41·21	185
South Molton .....(59)	E. Wales Johnson, Esq.	5	1	0	443 B	41·38	190
*Bideford (Buckish) .....(7)	Rev. J. H. Kirwan ...	5	1	1	550 B	47·25	196
* „ (Northam) .....(5)	Rev. J. D. Churchward	5	1	0	173	35·23	178
S. Molton (Castle Hill).....(4)	Mr. D. Wilson	12	3	5	200?	36·80	125
Barnstaple .....(3)	T. Mackrell, Esq.	8	0	6	31 ⅄	38·00	189
„ (Bratton Fleming)(2)	Rev. H. S. Pinder.....	5	2	0	700?	45·81	196
Ilfracombe Hotel .....(1)	Mr. W. Clark.....	12	9	0	25	34·25	172
CORNWALL.							
Land's End (Mayon House)	J. Symons, Jun., Esq..	5	4	10	308	36·09	166
†Helstone	M. P. Moyle, Esq.....	5	5	0	116 T	41·60	175
†Penzance	W. H. Richards, Esq.	12	3	0	94 T	44·71	...
„ (Poltair).....	H. R. Trelawny, Esq...	5	1	0	240	63·09	...
Camborne (Crowan)	Mr. J. T. Rodda.....	8	0	6	530 L	47·65	180
„	„ „ „	11	1	4	230 L	51·34	179
Falmouth (Carclew)	Mr. G. Palmer	5	0	6	...	48·73	173
†Redruth (Tehidy Park).....	Mr. Mill.....	5	0	6	100 T	39·92	...
† Truro (Royal Institution).....	Dr. Barham	5	40	0	56 ⅄	39·85	183
† „ (Penarth)	N. Whitley, Esq.	12	1	0	190 ⅄	40·96	200
†St. Agnes.....	Mr. Opie.....	11	1	8	278 B	42·30	160
†*St. Austell (Trevarna)	W. Coode, Esq.	5	0	6	300 ⅄	47·66	159
„ (Trevarrick)	C. Truscott, Jun., Esq.	5	1	0	169 ⅄	48·87	202
„ (Polcarne)	J. Coode, Esq.	5	1	0	206 T	50·29	165
Par Station (Penellick).....	W. E. Geach, Esq. ...	5	0	9	240 B	36·88	...

DIVISION V.—SOUTH-WESTERN COUNTIES—(*continued*).

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	in.	Height above SeaLevel feet.	Depth of Rain. 1871 inches.	Days on which ·01 or more fell.
CORNWALL—(*con.*)							
†Newquay	Mr. W. H. Tregidgo...	6	1	9	90 B	41·02	153
Saint Columb	Mr. J. Best	5	5	0	...	42·32	161
†Liskeard (Dean Terrace).....(47)	S. W. Jenkin,Esq.C.E.	5	1	1	375 ⅄	50·43	198
„ (St. Cleer) .....(68)	„ „ „	5	1	1	620 ⅄	48·01	...
†Saltash (Pentillie Castle) ...(46)	Mr. C. Edwards	5	1	3	150 B	50·34	168
†Callington (Hingston Down)(39)	Captain Richards	11	1	0	850 T	59·51	169
† „ (Church Street) ...(40)	Mr. J. Brown, Jun. ...	5	3	0	490 T	54·54	200
†Bodmin (Castle Street)	Capt. Liddell, R.N. ...	8	2	6	338 T	49·12	206
† „ „ „	„ „	5	1	0	338 T	51·00	206
† „ „ „ *weekly*	„ „	5	0	1	338 T	51·78	...
† „ (Fore Street)	A. Hambly, Esq.	8	2	6	336 T	50·98	208
† „ (Warleggan)	Rev. D. Clements	8	2	6	660	48·75	...
†Wadebridge.....	Mr. C. Jordan	8	2	6	23 T	37·37	163
† „ (Treglines, St. Minver)	Mr. T. Liddell, Jun....	10	3	0	140 T	35·17	168
† „ (Treharrock House) ...	H. A. Hambly, Esq....	5	2	9	303 T	30·16	171
†St. Endellion (Park Villa).....	Miss Guy	10	3	0	277	26·97	177
†Launceston (Altarnun) .....(28)	C. U. Tripp, Esq.	5	0	7	570 B	56·24	199
† „ (Hexworthy) ...(27)	H. M. Harvey, Esq. ..	5	2	7	411 T	47·33	159
SOMERSET.							
Chard (Cricket St. Thomas).....	Viscount Bridport.....	5	1	0	400 B	40·37	169
Crewkerne (Bincombe House) ...	F. J. Sparks, Esq. ...	5	1	2	250	38·72	153
Ilminster	J. Knott, Esq.	5	1	0	131 ⅄	32·48	...
„ .... *(monthly)*	„ „ „ ...	5	...		...	31·52	...
„ (South Petherton).....	W. Blake, Esq.	8	0	6	200 ?	30·75	178
Ilebrewers (Walrond Park)	J. Ostler, Jun., Esq....	5	1	0	116 T	28·83	140
Ilchester	J. W. Bourne, Esq. ...	8	2	0	40 ?	30·30	127
*Wellington (Sunnyside).....	W. Elworthy, Esq. ...	5	1	0	...	30·67	154
*Taunton (Fullands School)	W. Reed, Esq.	5	1	6	...	24·90	...
„ (College School)	Rev. W. Tuckwell ...	5	1	0	80 B	27·53	155
„ (The Mount)	H. Alford, Esq.	5	1	1	88 B	27·44	173
„ (The Castle)	G. Gillett, Esq.	8	1	6	50	27·95	165
*Wiveliscombe	B. Boucher, Esq.	5	1	2	...	32·85	172
Taunton (Bishops Lydeard)	Mr. R. King	5	1	2	...	32·13	178
Glastonbury (Street)	W. S. Clark, Esq.....	8	1	0	60	30·53	154
Wells (Dinder)	Rev. T. J. Bumpsted	8	4	0	140 B	39·01	146
Burnham (The Colony)	Captain Estlin	5	1	0	18 ⅄	28·02	134
Frome (Mells Rectory)	Rev. J. H. Horner. ...	5	1	0	342 ⅄	36·16	174
E. Harptree(SherborneReservoir)	Bristol Water Works	5	1	0	338	40·52	...
Bath (Paragon)	Dr. Barter	5	6	0	112 ⅄	28·16	161
„ (Gay St.)	„ „	5	1	3	145 T	28·17	160
„ (Literary Institute)	C. P. Russell, Esq.....	5	8	0	75 ⅄	28·02	150
„ (Weston)	.....	5	10	0	190 L	27·26	168
Bathampton Lodge.....	J. G. Ross, Esq.....	5	1	0	100 B	31·44	158
Batheaston (Bannerdown House)	Colonel Ward.....	5	1	0	250 ⅄	28·87	160
„ (Reservoir)	A. Mitchell, Esq.	12	2	0	226 T	25·07	120
Chelvey [Bristol]	Rev. J. Matthew	5	0	5	37 ?	29·48	173
Barrow Gurney Reservoir.....	**Bristol Water Works**	**5**	**1**	**0**	**320**	**33·07**	...

DIVISION VI.—WEST MIDLAND COUNTIES.

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground.		Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft.	in.	feet.	inches.	
GLOUCESTER.							
Bristol (Canon's Marsh)	W. D. Nash, Esq.	5	12	6	30 ?	27·87	165
„ (Small St.)	Bristol Water Works	5	25	0	40	26·31	...
Clifton (South Parade)	Dr. G. F. Burder	8	0	6	192 ⅄	29·10	...
Chipping Sodbury (Badminton)	Mr. McNaughton	5	0	8	...	30·63	119
Fairford (Kempsford)	R. A. Iles, Esq.	5	0	8	...	24·66	135
Nailsworth (Spring Hill)	H. D. Humphries, Esq.	8	2	0	160 ?	32·30	156
Berkeley (Salter-street)	J. H. Cooke, Esq.	5	8	0	60	28·18	140
Lydney	Rev. W. H. Bathurst	8	1	0	30	34·71	...
Cirencester (The Firs)	J. Bravender, Esq.	5	0	8	350	29·31	152
„ (Further Barton)	T. C. Brown, Esq.	10	1	2	420	32·40	...
Stroud (Brimscombe Port)	J. H. Taunton, Esq., C.E.	8	10	0	200 ⅄	27·72	113
„ (Upfield)	Miss Stanton	5	0	11	226 ⅄	27·96	153
„ (Castle Villas)	J. Bateman, Esq.	...	1	0	240 B	29·79	180
Fairford (Hatherop Rectory)	Rev. R. P. Davies	8	1	3	412 ⅄	26·15	142
Frampton-on-Severn (Saul Lodge)	W. B. Clegram, Esq. C.E.	5	3	6	42 ⅄	27·50	151
Northleach (Yanworth)	T. Arkell, Esq.	5	1	0	...	28·56	...
Cheltenham (Cowley Manor)	Mr. J. Sadler	5	1	4	600	34·37	160
Gloucester (Witcomb Court)	A. Bubb, Esq.	8	2	0	225	31·36	...
„ („ Water Works)	T. Small, Esq.	8	3	0	297 ⅄	29·27	131
„ (Quedgeley Ho.)	J. C. Hayward, Esq.	5	0	10	50 ?	27·96	...
„ (Park House) *monthly*.	Alfred Price, Esq.	5	3	6	50 ⅄	25·49	...
„ (County Asylum)	E. Toller, Esq., M.D.	8	0	6	100	26·12	140
Huntly	Rev. H. Miles	5	0	8	210	30·44	...
„	Rev. W. L. W. Eyre	5	0	6	200 B	30·59	...
Cheltenham (Prestbury)	G. Makgill, Esq.	5	0	8	180 ?	27·89	131
„ (Keynsham Bank)	H. D. Humphries, Esq.	8	6	6	232 ⅄	27·53	128
„ (Hatherley Sew. Wks.)	„ „ „	8	16	6	172 ⅄	22·53	123
„ (Arle=Chelt „ „)	„ „ „	8	16	6	169 ⅄	19·83	125
Newent (Boyce Court)	General Drummond	5	1	0	133	27·50	139
Moreton-in-Marsh (Frogmore)	W. Arkell, Jun., Esq.	5	0	9	...	26·13	131
HEREFORD.							
Ross (Rocklands)	J. M. Herbert, Esq.	8	1	10	100 ?	33·77	156
„ (The Graig)	H. Southall, Esq.	5	1	0	250 ?	29·41	146
„ (Sellack Vicarage)	Rev. W. C. Ley	5	0	5	...	28·47	142
Hereford (Fownhope Vicarage	Rev. T. West	5	1	1	...	29·10	146
„ (The Blue School)	W. Cooke, Esq.	8	6	0	190	24·93	...
„ (Richmond Place)	E. J. Isbell, Esq.	8	5	8	188 ⅄	27·74	154
„ (Davison's Nursery)	„ „ „	8	1	0	198 T	28·44	...
„ (Hagley Park)	A. Hutchinson, Esq.	5	0	6	284	25·42	...
„ (Tupsley)	P. Ballard, Esq.	5	1	1	...	26·05	...
„ (Stretton)	Rev H. C. Key	5	1	0	198 T	29·17	142
Bredwardine	Rev. S. Clark	5	1	0	290 ?	29·13	...
Staunton-on-Wye	Rev. H. W. Phillott	5	1	0	255	27·31	151
Kington (Lynhales)	S. Robinson, Esq.	8	1	0	...	31·89	87
Leominster (West Lodge)	E. P. Southall, Esq.	5	1	0	250 T	27·76	164
Kington (Burcher Cottage)	Miss Boddington	12	2	8	...	33·76	...
Leominster (Leysters)	Rev. T. S. Hewitt	5	0	4	600 ?	29·00	...

DIVISION VI.—WEST MIDLAND COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	in.	Height Above Sea Level feet.	Depth of Rain. 1871 inches.	Days on which .01 or more fell.
SHROPSHIRE.							
Burford [Tenbury]	Lord Northwick	5	0	11	100?	31·25	...
Ludlow (Knowbury)	Rev. J. B. James	6	0	4	1000?	30·02	...
„ (Mill Street)	W. Marston, Esq.	5	1	1	337 T	31·77	182
Craven Arms (Stokesay)	Rev. J. D. La Touche	5	1	0	...	29·95	145
Bridgenorth (Quatt School)	Mr. L. Roach	5	4	2	194 ⅄	25·65	149
„ (Dudmaston Hall)	Mr. H. Brown	5	1	0	...	26·97	153
Bishop's Castle (More Rectory)	Rev. A. S. Mall	5	1	6	640 T	27·34	168
Church Stretton (Woolstaston)	Rev. D. Carr	5	1	0	790 B	33·29	190
Shiffnal (Haughton Hall)	Rev. J. Brooke	5	3	5	355 ⅄	26·06	169
Shrewsbury	Marshall & Co.	10	4	4	192	21·45	...
„ (Monkmoor)	Miss Lovett	5	1	0	200 B	25·08	165
„ (Fitz Manor)	R. Middleton, Esq.	5	2	6	287 B	24·22	...
Newport (Cheswell Grange)	T. Radcliffe, Esq.	...	1	0	250	27·66	...
Oswestry (Hengoed)	Rev. A. R. Lloyd	5	6	0	470 ⅄	36·00	...
Dudleston (Erwy)	G. F. Reynolds, Esq.	8	1	0	400?	26·97	...
Market Drayton (Nort'n-in-Hales)	Rev. F. Silver	8	1	0	335 B	27·62	127
„ (Adderley)	Rev. Athelstan Corbet	5	0	9	245?	29·99	174
ℬ𝔄*Whitchurch	A. B. George, Esq.	5	3	0	...	32·66	143
STAFFORD.							
Wolverhampton (Oaklands)	H. Ward, Esq.	5	1	0	525 ⅄	30·00	173
„ (Waterloo Road)	C. G. DeLessert, Esq.	5	1	1	500	28·34	162
„ (Merridale Road)	John Thrustans, Esq.	5	1	0	426 ⅄	28·22	178
„ (Wrottesley) *monthly*	Mr. E. Simpson	8	0	8	490	26·96	...
Patshull Gardens	Mr. S. James	...	1	5	...	24·23	129
Tamworth	W. Arnold, Esq.	5	1	0	160?	24·65	155
Weston-under-Lyziard [Shiffnal]	Hon. Rev. J. Bridgeman	3	0	10	...	27·78	191
Rugeley (Beau Desert)	Mr. W. R. Robson	8	0	4	600?	32·29	155
Burton-on-Trent	J. Matthews, Esq.	5	4	0	152 ⅄	26·41	160
„ (Horninglow)	R. W. Abbotts, Esq.	5	4	0	150	27·57	177
Stoke (Barlaston)	W. Scott, Esq.	5	0	6	530 T	33·87	150
Oakmoor (Ellaston)	Rev Sir C. R Lighton, Bt.	5	3	0	400	36·16	175
Stoke (Stanley Reservoir)	†Trent & Mersey Navga.	5	3	1	550 T	35·24	140
Leek (Rudyard)	„ „ „	5	12	7	500 T	33·89	147
Knypersley [Congleton]	„ „ „	5	14	0	500 T	40·09	148
Wincle [Macclesfield]	„ „ „	5	5	0	500 ⅄	35·76	130
WORCESTER.							
Northwick Park	Lord Northwick	8	1	6	...	27·63	...
Evesham (Lansdowne)	R. Burlingham, Esq.	8	4	6	124 B	25·23	127
West Malvern	A. H. Hartland, Esq.	8	1	6	850 B	33·71	...
Worcester (Beechwood)	W. Burgess, Esq.	5	1	0	137?	25·41	116
„ (Gas Works)	F. N. Gosling, Esq.	10	4	1	...	22·79	...
Tenbury (Orleton)	T. H. Davis, Esq.	5	0	9	200?	30·99	180
Bromsgrove (The Ford House)	G. Dipple, Esq.	11	4	4	273 ⅄	25·61	125
Stourbridge (Hagley Rectory)	Hon. Mrs. Lyttleton	8	0	5	636 ⅄	29·47	163
Selly Hall [Birmingham]	Rev. E. W. Winter	8	3	6	...	29·28	121
Moseley [Birmingham]	T. L. Plant, Esq.	5	4	0	487 ⅄	30·31	185

‡ Returns supplied by W. J. Snape, Esq.

DIVISION VI.—WEST MIDLAND COUNTIES.—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	in.	Height Above Sea Level feet.	Depth of Rain. 1871 inches.	Days on which ·01 or more fell.
WARWICK.							
Radway (Ivy Lodge)	Rev. G. Miller	5	1	1	530 T	28·16	165
Alcester (Sambourne)	A. Winkfield, Esq.	5	1	3	...	28·79	...
„ (Studley)	Mr. J. Bourn	5	0	10	350 ?	30·03	174
Henley-in-Arden (Arden House)	G. R. Dartnell, Esq.	5	2	0	400 ?	29·34	143
Leamington (Upper Parade)	S. U. Jones, Esq.	5	0	8	195 ⅄	23·31	153
Coventry (Priory Row)	J. Gulson, Esq.	8	1	0	279 ⅄	24·91	160
„ (Radford)	Miss Atkins	8	1	0	305	22·32	153
„ (Coundon)	R. Caldicott, Esq.	5	1	2	350	24·82	153
Bickenhill Vicarage	Rev. W. R. Capel	5	1	2	371 ⅄	29·39	167
Birmingham (Botanic Gardens)	Mr. Latham	5	5	2	...	27·55	167
† „ (Bloomsbury Street)	D. Smith, Esq.	8	0	10	340 T	30·62	158
Nuneaton (Stretton Ho.)	T. J. Scott, Esq.	5	0	6	...	23·13	138

DIVISION VII.—NORTH MIDLAND COUNTIES.

LEICESTER.							
†Market Harborough (Fleckney)	J. B. Putt, Esq.	5	0	8	411 T	27·28	...
†Wigston	T. Burgess, Esq.	8	0	6	220 T	24·28	152
Leicester (Freeman's Common)	H. Billson, Esq.	5	0	10	...	25·97	159
„ (Belmont Villas)	„ „ „	8	0	6	235	30·21	159
†Thornton Reservoir	C. Tebbutt, Esq.	10	2	8	420 ?	26·10	138
Appleby Magna	Rev. T. Felton Falkner	5	1	0	334	22·66	135
ℬ𝔄†Owston [Oakham]	Miss Gilford	5	1	0	580 B	29·11	163
Thurcaston (Cropston)	C. Tebbutt, Esq	8	1	0	...	25·34	144
Melton Mowbray (Dalby Hall)	Mr. G. Jones	8	2	6	480 B	24·65	158
Loughborough (Cedar Cottage)	J. Giles, Esq.	5	0	9	400 ?	29·36	...
Harston [Grantham]	C. Beasley, Esq.	...	...		...	21·07	...
†Belvoir Castle	W. Ingram, Esq.	8	1	0	237 T	25·54	117
RUTLAND.							
Ryhall	Rev. C. Potchett	5	...		...	23·11	109
Thistleton Rectory	Rev. C. A. Holmes	5	0	10	...	24·32	147
LINCOLN.							
Stamford (Barn Hill Ho.)	Dr. Newman	5	1	0	116 T	25·83	...
*Bourne (Wytham-on-the-Hill)	A. C. Johnson, Esq.	5	1	3	167 ?	19·09	129
Spalding (Pode Hole)	A. Harrison, Esq.	12	0	0	20 ?	25·50	...
†Grantham	J. W. Jeans, Esq.	8	0	6	179 ⅄	22·19	...
Sleaford (Heydour)	Rev. G. F. Deedes	5	2	0	...	23·79	90
Boston (Bargate Lodge)	Dr. Mercer Adam	5	1	0	20 ⅄	22·72	161
„ (Grand Sluice)	„ „ „	8	6	0	25 ⅄	21·60	150
„ (Pen Street)	W. H. Wheeler Esq. C.E	5	4	0	16 ⅄	23·81	154
Stubton [Newark]	G. Nevile, Esq.	5	4	6	...	24·14	145
Lincoln (Navenby)	Rev. J. Hays	8	0	6	...	24·88	154
Horncastle (Miningsley)	W. H. Wheeler, Esq, C.E	5	0	6	135 ⅄	22·35	136
Lincoln (Branston Hall)	A. S. Leslie Melville, Esq	5	0	9	200 T	23·38	148

DIVISION VII.—NORTH MIDLAND COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·10 or more fell.
			ft. in.	feet.	inches.	
LINCOLN—(*con.*)						
Lincoln	M. S. & L. R. Co.‡	9	3 6	26	19·12	125
Gate Burton	„ „ „	9	3 6	96	22·46	116
Louth	T. W. Wallis, Esq.	3	6 0	80 L	25·68	155
Market Rasen	M. S. & L. R. Co.	9	3 6	100	23·15	161
Gainsborough	„ „ „	9	3 6	76	22·37	135
Stockwith	„ „ „	9	3 6	21	23·05	101
Brigg	„ „ „	9	3 6	16	24·17	118
Grimsby	„ „ „	9	15 0	42	22·68	137
Barnetby	„ „ „	9	3 6	51	27·65	164
Crowle (Keadby)	„ „ „	...	...	10	28·85	105
Ulceby (Killingholme)	Rev. J. Byron	5	1 4	60 T	27·54	185
Brigg (Appleby)	Rev. J. E. Cross	5	0 9	60 L	25·66	...
„ (Ferriby Sluice)	„ „ „	5	0 9	10	23·87	...
New Holland	M. S. & L. R. Co.	9	3 6	18	24·56	161
NOTTS.						
Nottingham (Ruddington Grange)	C. Paget, Esq.	8	1 1	...	25·93	170
„ (Arboretum)	M O. Tarbotton Esq C.E	8	0 9	241 T	26·83	149
„ „ „	„ „ „	8	25 6	266 T	25·73	144
„ (Gedling)	Hn&RvO.W.Forrester	6	1 6	130?	26·92	151
Southwell (Oxton)	H. Sherbrooke, Esq.	2	2 0	...	26·38	...
„	W. W. P. Clay, Esq.	6	1 0	200?	19·02	...
Mansfield	R. Tyrer, Esq.	5	0 9	350 T	30·12	148
Ollerton (Whitemoor)	H. Horncastle, Esq.	12	3 2	175	26·63	150
Welbeck Abbey	Mr. W. Tillery	5	4 0	80 T	25·48	131
Worksop	M. S. & L. R. Co.	9	3 6	127	25·31	130
Retford	„ „ „	9	3 6	52	23·49	94
DERBY.						
Trent College	C. U. Tripp, Esq.	5	0 7	150?	28·19	170
Derby (Mickleover)	Mr. Ryley	5	17 6	310 B	27·56	...
„	J. Davis, Esq.	5	6 0	180 T	28·70	178
„ (West Hallam)	Rev. C. J. Newdigate	5	2 0	356?	29·74	175
„ (Duffield)	Mr. W. Bland	5	1 0	200?	29·97	160
Belper	J. G. Jackson, Esq.	5	0 8	222 T	29·04	170
Ripley (The Elms)	P. Wright, Esq., F.C.S.	5	1 0	515	29·54	161
†Matlock (Willersley Gardens)	Mr. J. Tissington	6	1 3	440	36·94	...
† „ Bath	R. Chadwick, Esq.	5	1 6	500 T	35·93	...
Chesterfield (Grassmoor Colliery)	E. Bromley, Esq.	5	9 0	...	27·38	163
„	M. S. & L. R. Co.	9	3 6	248	26·56	103
Brampton (St. Thomas')	Rev. J. M. Mello	5	3 0	312 T	29·53	136
†Buxton (Axe Edge)	E. J. Sykes, Esq.	8	1 0	1620 B	36·35	...
† „ (Devonshire Hospital)	„ „ „	8	5 0	1005 T	47·12	230
†Stony Middleton	Rev. U. Smith	5	4 0	692 B	34·52	149
Kilnarsh (Norwood)	M. S. & L. R. Co.	9	3 6	238 T	27·15	154
Comb's Moss	„ „ „	9	3 6	1669 T	46·12	...
„ Reservoir	„ „ „	9	3 6	710 T	45·14	202
†Chapel-en-le-Frith	„ „ „	9	3 6	965 T	41·55	177

‡ Kept for the Canals Department of the Manchester, Sheffield, and Lincolnshire Railway Company. Returns supplied by R. D. Heathcote, Esq.

DIVISION VII.—NORTH-MIDLAND COUNTIES—(*continued*).

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter	Rain Gauge. Height Above Ground.	Rain Gauge. Height Above Sea level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
DERBY—(*con.*)						
Burbage House	Mr. John Farrar	5	2 10	...	32 97	...
Bamford	J. H. Moore, Esq.	5	0 3	500?	34·31	...
Castleton	Miss Hall	...	...	...	40·10	...
† „ (Mam Tor)(*monthly*)	A. Haslewood, Esq.	8	1 0	1700 T	39·95	..
† Woodhead	M. S. & L. R. Co.	9	3 6	878 T	40·93	168

DIVISION VIII.—NORTH-WESTERN COUNTIES.

CHESHIRE.						
Nantwich (Cholmondelly Cas.)	E.L.Williams,Esq.C.E.	8	1 6	42	31·73	177
Chester (Pulford Hall)	R. Massie, Esq.	5	3 0	51 T	27·23	194
Bosley Minns	M. S. & L. R. Co.	9	3 6	1210 T	32·86	111
„ Reservoir	„ „ „	9	3 6	590 T	29·82	140
Chester (Newton Nurseries)	J. Dickson & Sons	8	0 6	62 ⅄	29·81	168
Macclesfield	M. S. & L. R. Co.	9	3 6	539 T	36·34	150
„ (Park Green)	W. Jeffery, Esq.	8	2 1	450 ⅄	32·82	166
Chelford	Mr. C. Nichols	5	1 6	260 ⅄	33·96	133
Northwich (Highfield)	E.L.Williams,Esq.C.E.	8	1 6	65	31·94	178
Neston	Capt. Monk, R.N.	5	4 0	50?	26·53	...
„ (Hinderton)	Reginald Bushell, Esq.	5	1 0	211 ⅄	25·55	174
Runcorn (Weston Point)	E.L.Williams,Esq.C.E.	8	1 6	15	30·88	143
Bollington (Spond's Hill)	M. S. & L. R. Co.	9	3 6	1279 T	32·40	...
Whaley	„ „ „	9	3 6	602 T	38·54	212
Altrincham (Barrington House)	J. Newton, Esq., C.E.	5	1 0	105	34·89	...
† Birkenhead (Bidstone Obs.)	J. Hartnup, Esq.	8	0 6	182	27·32	178
Marple Aqueduct	M. S. & L. R. Co.	9	3 6	321 T	25·70	143
„ Top Lock	„ „ „	9	3 6	543 T	27·74	148
Godley Reservoir	J.F.Bateman,Esq.FRS	...	...	500	31·45	...
Mottram Hill End	M. S. & L. R. Co.	9	3 6	680 T	36·83	186
„ Matley's Field	„ „ „	9	3 6	399 T	34·20	189
Newton	„ „ „	9	3 6	396 T	31·18	173
Arnfield Reservoir	J.F.Bateman,Esq.FRS	...	..	575	33·88	...
Staleybridge (Swineshaw)	Mr. W. Watts	9	3 0	884 ⅄	45·34	153
† Rhodes Wood Reservoir	J.F.Bateman,Esq.FRS	12	1 0	520	38·99	...
† Woodhead „	„ „ „	12	0 10	680	43·73	...
† Torrside „	„ „ „	12	1 6	600	38·27	...
Tintwistle (Featherbed Moss)	Mr. W. Watts	8	1 0	...	48·67	...
LANCASHIRE.						
Warrington (Bewsey Street)	L. W. Reynolds, Esq.	5	1 0	40 T	34·18	185
„ (Aspley)	R. Vawser, Esq	10	10 0	33 ⅄	32·46	183
West Derby (Sandfield Park)	Mr. W. Biggs	8	1 2	147 ⅄	25·75	...
Liverpool (Grove Park)	J. R. Darsie, Esq.	3	7 0	100	30·56	141
Walton-on-the-hill	A. R. Andersson, Esq.	5	1 11	80	30·71	174
Heaton Chapel (Roseleigh)	J. Curtis, Esq.	8	2 3	235 T	30·35	187
Denton Reservoir	J.F.Bateman,Esq.FRS	...	...	324	29·16	...
Gorton „	„ „ „	...	...	263	29·58	...
Prescot (Knowsley)	Mr. J. Freeman	6	15 0	220 ⅄	32·27	...

DIVISION VIII.—NORTH WESTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft	in.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
					feet.	inches.	
LANCASHIRE—(*con.*)							
†Manchester (Old Trafford)	G. V. Vernon, Esq. ...	8	2	7	106 ⅄	33·23	182
„ (Plymouth Grove)...	J. F. Roberts, Esq.....	8	3	9	150 ⅄	32·12	184
„ (Eccles)	T. Mackereth, Esq.....	10	3	0	145 ⅄	33·16	192
„ „	„ „ „	5	34	0	179 ⅄	27·46	192
Salford (Town Hall)	„ „ „	5	7	0	115 ⅄	30·27	199
Manchester (Ardwick)	J. Casartelli, Esq.....	9	3	0	149 ⅄	33·64	185
† „ (Piccadilly)	M. S. & L. R. Co.....	9	40	0	194 T	29·18	168
Fairfield	„ „ „	9	6	0	312 T	36·30	191
St. Helen's (Rainford Hall)	G. McKibbin. Esq.....	5	0	9	147 ?	33·39	194
Shore Top (Outwood)	H. Bridson, Esq.	12	1	0	295 T	36·90	178
Wigan (Water Works)	J. L. Hunter, Esq., C.E.	6	1	6	225 ⅄	36·33	178
Oldham (Waterhouses)	M. S. & L. R. Co.	9	3	6	345 T	36·91	167
„ (Gas Works).....	J. Taylor, Esq.	9	6	0	600 T	32·11	205
„ (Brushes Clough)	„ „ „	10	6	0	950 T	34·76	210
„ (Piethorne)	„ „ „	10	6	0	800 T	29·15	214
BA*„ (Royton)	Mr. B. K. Bentley ...	5	1	0	544 ⅄	37·25	165
Bolton-le-Moors (The Folds).....	H. H. Watson, Esq....	10	3	6	286 T	40·93	...
„ (Arkwright St.).....	W. Musgrave, Esq.....	9	6	6	352 ⅄	43·40	196
„ (Heaton)	H. Baylis, Esq.	10	0	0	500	40·40	146
„ „	J. S. Holdsworth, Esq	10	3	6	497 ⅄	41·62	198
„ (Moss Bank)	R. H. Ainsworth, Esq.	8	1	2	570	47·15	213
„ (Halliwell New Road)	W. Tyson. Esq.	5	1	4	549	47·01	238
„ (Belmont)	H. Baylis, Esq.	10	0	0	800	46·80	152
Entwistle.....	„ „ „	...	0	0	700	44·00	142
Rochdale (Nagden Dane).....	C. E. Cawley, Esq. M.P.	5	1	6	900	34·65	...
Ormskirk (Rufford)	J. Porter, Esq.	5	0	8	38 T	31·95	180
Rawtenstall	E. Barber, Esq.	8	1	0	550 ⅄	45·60	220
„ (Hapton Reservoir)	„ „ „	8	1	0	900 ⅄	44·94	228
Blackburn (W. Works Office)....	J. F. Bateman, Esq. FRS	...	...		400	37·90	...
„ (Pickup Reservoir) ...	„ „ „	...	...		720	38·10	...
„ (Guide Reservoir) ...	„ „ „	...	...		650	35·60	...
„ (Audley Place).....	J. Shackleton, Esq. ...	5	0	6	450	41·73	205
Burnley W. Works (Swindon)...	J. Emmett, Esq.	...	18	0	750	23·04	...
Preston (Howick House) *old gauge*	T. Norris, Esq.	12	0	6	73 ⅄	34·25	...
„ „ (*new gauge*)	„ „ „	12	0	6	73 ⅄	35·50	...
„ (Atherton Terrace)	J. Armytage, Esq., C E.	8	1	2	175 ⅄	34·11	...
Kirkham (Weeton Res. Bank) ..	J. Bradley, Esq.....	10	1	0	...	25·57	...
Blackpool (South Shore)	G. Sharples, Esq.	10	1	8	29	29·94	...
Stonyhurst College	Rev. S. J. Perry	11	0	8	376 ⅄	43·91	205
„ „ (*monthly*) ...	„ „	11	0	8	376 ⅄	42·84	...
Preston W. Works. Alston	J. Armytage, Esq., C.E.	8	1	2	320 ⅄	35·56	...
Knowl Green	„ „	8	1	2	400 T	35·52	...
Jeffrey Hill	„ „	8	1	2	900 T	41·36	...
Loud-scales	„ „	8	1	2	400 T	34·45	...
Spade Mill	„ „	8	1	2	400 T	33·73	...
Clitheroe (Downham Hall)	R. Assheton, Esq. M.P	10	1	6	464 ⅄	38·25	...
Garstang (Vale House)	J. Jackson, Junr., Esq.	6	4	3	455 ⅄	42·93	205
„ (Grizedale).....	J. Bradley, Esq.....	8	1	0	480 ?	46·11	...

DIVISION VIII.—NORTH-WESTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES,	Rain Gauge. Diameter.	Height Above Ground.	Height Above SeaLevel	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
LANCASHIRE—(*con.*)						
Lancaster (South Road)	W. Roper, Esq.	12	3 6	114	38·46	184
† ,, (Caton)	Rev. A. Christopherson	5	1 6	120 T	39·59	169
Hest Bank	T. Ransome, Esq.	12	2 2	58	36·17	...
Arkholme (Storr's Hall)	F. F. Pearson, Esq.	5	1 0	220 T	37·37	...
Silverdale [Milnthorpe]	Rev. C. C. W. Shepheard	5	1 0	56 T	36·74	...
Cartmel (Flookburgh)	T. R. Croasdale, Esq.	5	2 4	70 B	39·40	101
† ,, (Allithwaite)	Mr. W. R. Nash	5	1 0	88 T	36·86	187
† ,, (Holker)	Mr. Wilson	8	4 8	155 ⅄	42·41	205
,, (Bay Villa)	Amos Beardsley, Esq.	8	3 2	25 ⅄	41·52	192
*Ulverston	J. H. Matthews, Esq.	5	5 6	162 ⅄	47·73	194
†Cartmel (Broughton Hall)	Captain Ainsworth	5	2 8	230 T	46·74	161
Newby Bridge (Backbarrow)	,, ,, ,,	12	3 2	70 T	39·10	123
†Coniston (Lanehead)	R. J. Bywater, Esq.	5	1 0	287 T	69·55	183
†Monk Coniston Park	J. G. Marshall, Esq.	10	4 11	150 ⅄	69·80	...

DIVISION IX.—YORKSHIRE

WEST RIDING.						
Sheffield (Edge)	M. S. & L. R. Co.	9	3 6	336 T	32·43	178
,, (Broomhall Park)	D. Doncaster, Jun. Esq.	10	2 0	340 ⅄	30·63	177
†Redmires	J. Gunson, Esq.	10	4 0	1100 T	34·82	203
Sheffield (Tinsley Locks)	M. S. & L. R. Co.	...	...	143 T	27·70	160
Tickhill	Dr. Dixon	8	2 0	61 ⅄	26·44	142
†Rotherham (Moorgate Grove)	R. Chrimes, Esq.	5	1 0	262 ⅄	25·98	169
,, (Wath-upon-Dearne)	W. M Burman, Esq.	8	0 8	180 ⅄	24·19	155
Doncaster	M. S. & L. R. Co.	9	...	35 T	26·61	144
,, (Magdalens)	Mr. J. Howorth	5	5 9	46	26·69	129
†Dunford Bridge	M. S. & L. R. Co.	9	3 6	954 T	46·93	199
† ,, (Reservoir)	Mr. G. Whitfield	12	2 0	1100 T	40·74	202
†Penistone	M. S. & L. R. Co.	9	3 6	717 T	31·55	159
†Carlcotes	,, ,, ,,	9	3 6	1075 T	49·19	167
Greenfield (Charnel Rocks)	Mr. Watts	8	1 0	...	46·54	...
,, (Asway Hey)	,, ,, ,,	8	1 0	...	45·57	...
,, (Lord's Moor)	,, ,, ,,	8	1 0	...	49·45	...
Barnsley (Elsecar)	M. S. & L. R. Co.	9	...	175 T	26·32	151
,, (Worsborough)	,, ,, ,,	9	...	225 T	31·52	191
,,	,, ,, ,,	9	...	175 T	25·53	132
,, (Church Street)	Dr. Sadler	5	3 10	350 T	27·32	178
†Saddleworth (Station)	E. Greenwood, Esq.	10	5 0	640 T	37·73	...
Denshaw	James Taylor, Esq.	10	6 0	1050 T	39·80	212
Strines Dale [Oldham]	,, ,, ,,	10	6 0	800 T	33·86	207
†Standedge	E. Greenwood, Esq.	8	2 0	1150 T	42·25	...
Ackworth School	G. Satterthwaite, Esq.	5	0 3	135	26·20	160
Snaith (Balne Vicarage)	Rev. T. S. Ackland	5	1 0	25 ⅄	29·26	139
Goole	T. Kendall, Esq.	11	3 4	...	27·80	202
†Meltham (Harden Moss)	C. K. Hare, Esq.	8	1 0	1200 T	39·46	...
† ,, (Grange)	,, ,, ,,	8	1 0	930 T	33·96	...

DIVISION IX.—YORKSHIRE—(*continued*).

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground.	Height Above Sea Level	Depth of Rain 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
WEST RIDING—(*con.*)						
Golcar	J. E. Ramsden, Esq....	5	0 8	400 T	34·49	165
† Huddersfield (Longwood)	C. K. Hare, Esq.....	10	4 6	650 T	?19·04	159
„ („ Bilberry Edge)	„ „ „	8	1 0	1100	33·08	...
† „ (Dalton)	J. W. Robson, Esq. ...	8	0 6	350 ⅄	27·04	185
„ (Scissett)	A. M. Box, Esq.	3	0 3	475 ⅄	24·64	190
Mirfield (Cote Wall)	E. B. W. Balme, Esq...	8	0 9	200	22·03	121
Todmorden (Stansfield Hall)	J. Fielden, Esq., M.P.	8	1 10	556 ⅄	40·62	172
Halifax (Warley Moor)	J.F.Bateman,Esq,FRS	...	...	1425	35·80	...
† „ (Well Head) *monthly*	J Waterhouse,Esq.FRS	12	0 11	487 ⅄	27·90	...
„ („) (*daily*)	„ „ „	7	1 0	527 ⅄	30·67	173
„ (Park Road Obser.)	J. Gledhill, Esq.....	8	0 4	610 ⅄	39·06	183
„ (Midgley Moor)	J.F.Bateman,Esq,FRS	...	...	1350	39·60	...
„ (Ovenden Moor)	„ „	...	...	1375	36·70	...
„ (Walshaw Dean)	„ „	...	...	1380	42·40	...
Methley Park	J.Richardson,Esq.C.E.	5	0 9	98	26·37	187
South Milford Rectory	Rev. F. J. Young	5	1 4	60 T	29·65	147
Bradford (Mechanics' Institute)	C. Lund, Esq.	8	48 0	373 ⅄	25·17	183
„ (Hewenden)	C. Gott, Esq., C.E. ...	5	0 9	700 ⅄	29·94	167
„ (Chellow Dean)	„ „	10	5 0	650 ⅄	31·43	125
„ (Doe Park)	„ „	8	0 9	810 ⅄	35·66	190
„ (Queensbury)	W. Foster, Esq.	5	1 6	1050 ⅄	34·39	100
Leeds (Leventhorpe Hall)	J. T. Leather, Esq. C.E	10	2 0	90 ⅄	25·36	...
† „ (Holbeck)	Messrs. Marshall & Co.	10	32 0	127 ⅄	22·80	116
„ („)	„ „ „	5	1 0	95 ⅄	25·25	152
„ („ W. Works Depot)	E. Filliter, Esq, C.E...	8	1 3	95	26·93	155
„ (Woodhouse Moor)	„ „ „	8	0 9	305	26·37	158
„ (Weetwood Hall)	H. C. Marshall, Esq...	5	0 7	400 ⅄	27·29	170
„ („ Reservoir)	E. Filliter, Esq., C.E.	8	0 9	325	27·61	163
„ (Allerton Hill)	T. Fenwick, Esq., C.E.	5	0 7	418 ⅄	26·39	153
„ (Crag Wood, Horsforth)	James Fox, Esq., C.E.	5	0 10	350 ⅄	28·75	191
„ (Eccup)	E. Filliter, Esq., C.E..	8	0 9	340	29·82	177
Bashall Lodge [Clitheroe]	W. Garnett, Esq.	5	1 10	217 ⅄	46·01	187
Otley	T. E. Thorns, Esq. ...	8	0 7	206 ⅄	29·24	126
Harewood (Arthington)	E. Filliter, Esq., C.E.	8	0 9	140	28·44	159
Thornton-in-Craven	T. Wilson, Esq.....	5	5 4	456 ⅄	37·09	245
Skipton (Grammar School)	Rev. H. N. Grimley...	5	4 9	385 T	33·54	190
„ (Woodlands)	J. Heelis, Esq.	5	0 8	430	35·92	...
† York (Bootham)	J. F. Fryer, Esq.	5	0 6	50 ⅄	28·68	148
† „ (Coney Street)	Mr. Sigsworth	5	8 0	40 T	28·05	...
„ (Cherry Hill)	H. Richardson, Esq....	5	1 4	90	28·38	...
Otterburn-in-Craven	W. Gomersall, Esq. ...	5	1 0	510 ⅄	40·89	143
Harrogate	J. Coupland, Esq.	8	0 6	380 T	31·22	102
Barden Reservoir	C. Gott, Esq., C.E. ...	8	1 2	746 ⅄	33·81	164
Settle (Langcliffe)	Miss M. I. Sedgwick...	8	1 9	623	41·47	164
Pateley Bridge (Grimwith Res.)	C. Gott, Esq., C.E. ...	8	1 0	890 ⅄	41·54	181
„ „ (Fog Close Ho.)	E. Warburton, Esq. ...	5	2 4	431 ⅄	35·08	175
„ „ (Castle Stead)	Mr. A. C. Young	5	2 6	410 ⅄	39·78	159
Malham Tarn	W. Bissett, Esq.....	5	1 1	1190 T	50·93	...

DIVISION IX.—YORKSHIRE—(*continued*).

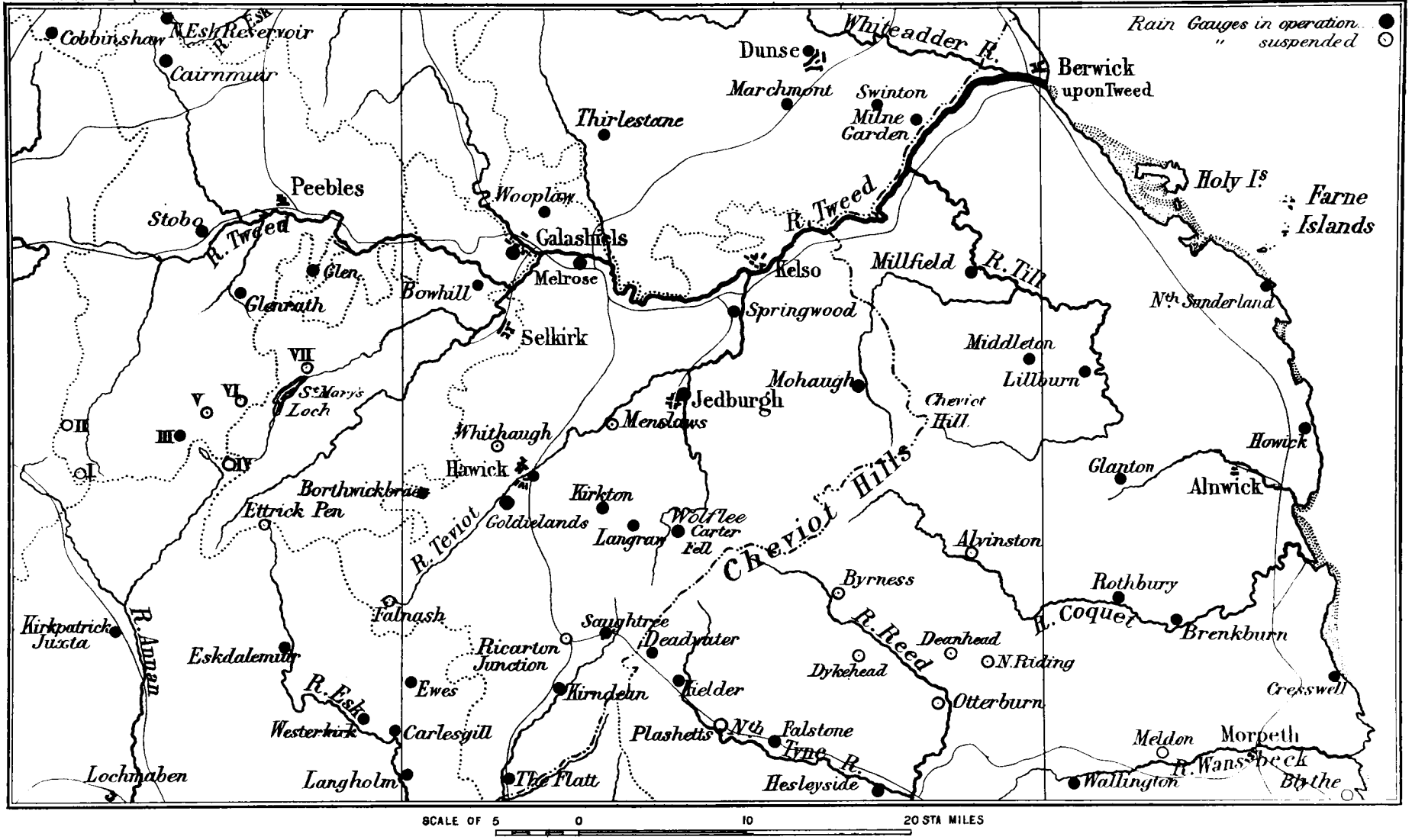
STATIONS.	AUTHORITIES.	Rain Gauge. Diameter	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches	
WEST RIDING—(*con.*)						
Arncliffe	Rev. W. Boyd	8	2 9	750 T	52·73	175
Ingleborough	J. Farrer, Esq.	10	6 2	...	35·26	...
Ripon (Littlethorpe)	Mrs. Swire	5	1 0	70 T	28·09	148
„ (North Lodge)	F. Wise, Esq.	5	1 0	120	26·22	...
Buckden	Rev. W. R. Metcalfe	10	2 7	800	59·71	205
Wharfedale(OughtershawSchool)	C. H. L. Woodd, Esq.	5	0 10	1225 T	57·30	192
„ („ Hall)	„ „	8	2 0	1150 T	59·26	143
Dent (Stone House)	Mrs. Nixon	5	1 1	800	60·23	154
Sedbergh (Thorne)	Miss Elam	5	1 1	400 T	46·49	208
EAST RIDING.						
Patrington	W. B. Pugh, Esq.	5	0 3	10 ⅄	25·28	198
†Hull (Beverley Rd., York Parade)	J. Smith, Esq.	8	3 10	11 T	25·68	170
„ (Baker Street)	A. Atkinson, Esq. LL.D.	5	1 0	10 ⅄	23·07	...
„ (People's Park)	Mr. E. Peak	5	0 6	6	25·91	171
Cottingham	J. H. Hill, Esq.	8	1 3	26 T	25·50	178
Beverley	T. Dyson, Esq.	12	8 0	62 ⅄	24·80	152
Pocklington (Warter)	J. Coxon, Esq.	5	1 10	230 T	31·53	188
Ganton Hall [Scarborough]	Mr. Boult	5	1 0	250 B	27·66	161
NORTH RIDING.						
Flaxton Grange	H. Richardson, Esq.	5	0 9	100	26·62	...
†Malton	H. Hurtley, Esq.	10	1 0	75 T	27·76	...
BA*Filey Reservoir	Mr. D. Philliskirk	5	0 9	183	26·28	146
Thirsk	A. Atkinson, Esq. LL.D.	5	1 6	114 ⅄	25·14	...
Bedale (Thorpe Perrow)	W. Culverwell, Esq.	6	2 0	170	25·46	...
Beadlam Grange	J. H. Phillips, Esq.	5	0 6	192 T	30·32	...
†Scarborough	Dr. Cornelius Fox	5	1 0	102 ⅄	27·93	180
„ (Hackness)	Rev. F. W. Stow	5	1 0	189	32·34	...
Leyburn (Wensley)	G. W. Wray, Esq.	7	2 3	650 ⅄	28·27	...
BA*Northallerton	Dr. Hodgson	5	1 3	133 T	27·34	...
Catterick (Tunstall)	H. C. Marshall, Esq.	5	1 0	350	25·02	...
Richmond (Aske)	Mr. J. Miller	12	2 8	550	29·05	...
Danby	Rev. J. C. Atkinson	..	1 0	480	31·77	...
Whitby (North Lighthouse)	Rev. F. W. Stow	5	1 0	198 T	24·73	...
„ (Ruswarp)	A. Atkinson, Esq. LL.D.	5	1 6	7 T	26·25	...
BA*„ (Guisbro' Road)	M. Simpson, Esq.	5	2 0	184 ⅄	24·54	173
Barningham Park	Sussex Milbank, Esq.	5	0 6	650 T	33·16	...
BA*Port Mulgrave	A. S. Palmer, Esq.	5	4 4	350 T	25·03	131
Greta Bridge (Thorpe Grange)	T. Dodgson, Esq.	5	1 6	431 T	29·19	...
Middlesboro' (Grey Towers)	W. R. J. Hopkins, Esq.	...	...	250	27·86	...
„ (Marton Hall)	H. W Bolckow, Esq. MP	10	1 6	152 T	25·24	140
Guisborough (Upleatham)	M. Gray, Esq.	4	0 4	330 ⅄	24·30	...
Middlesborough	W. Fallows, Esq.	8	1 0	21	26·21	151

DIVISION X.—NORTHERN COUNTIES.

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Rain Gauge. Height Above Ground.	Rain Gauge. Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
DURHAM.						
Eaglescliffe [Yarm]	Rev. J. Hull	5	1 0	80 ⅄	27·34	169
†Darlington (Southend)	Mr. J. Richardson	5	1 0	140 T	21·10	...
† „ „ „	„ „ „	9	1 0	140 T	24·27	...
„ (Brinkburn)	Rev. R. F. Wheeler	8	1 0	50 ?	23·47	...
„ (Gainford)	A. Atkinson, Esq.	5	1 0	253 ⅄	25·97	171
Sedgefield	Dr. Smith	5	0 10	360 ⅄	28·40	162
Hartlepool (Hurworth Burn)	T. Fenwick, Esq., C.E.	8	0 7	360	34·51	183
„ (Hart Reservoir)	„ „ „	8	0 9	164	25·68	148
Wolsingham (St. John's)	C. J. Backhouse, Esq.	5	1 1	928 ⅄	33·60	165
„	A. Mitchell, Esq.	5	1 0	464 ⅄	31·53	173
Stanhope Castle	Mr. T. Surtees	8	4 0	670 ⅄	32·82	...
Durham Observatory	J. J. Plummer, Esq.	12	4 6	335 ⅄	24·69	154
„ (S. Cuthbert's Col. Ushaw)	Rev. Dr. Gillow	5	0 10	600 ⅄	27·88	162
Seaham (Hall)	Mr. R. Draper	5	1 0	80 T	26·66	...
„ (Vicarage)	Rev. A. Bethune	5	0 4	80 T	26·03	102
Sunderland (West Hendon Ho.)	T. W. Backhouse, Esq.	5	1 0	132 ⅄	23·30	...
„ „ (*New gauge*)	„ „ „	5	1 0	132 ⅄	23·50	...
NORTHUMBERLAND.						
Shotley Hall	Mr. J. Coulson	5	0 3	312 T	26·96	139
Bywell	Mr. J. Dawson	8	0 6	87 T	33·53	204
Wylam Hall	G. C. Atkinson, Esq.	10	0 4	96 ⅄	26·69	149
Haltwhistle (Unthank Hall)	Rev. Dixon Brown	5	0 9	380	33·01	185
Newcastle (30, Rye Hill)	Robert Foster, Esq.	8	1 6	200	25·45	159
„ (Philos. Soc.)	W. Lyall, Esq.	8	1 5	105 T	20·91	116
„ (Town Moor)	Mr. W. Neill	5	0 6	201 T	26·16	196
North Shields (Wallsend)	J. W. Dees, Esq.	10	0 6	100 T	25·87	...
† „ (Rosella Place)	R. Spence, Esq.	8	1 0	124 T	26·18	178
„ (Low Lights)	J. R. Procter, Esq.	8	3 1	22 ⅄	24·11	162
„ (Tynemouth)	P. J. Messent, Esq.	5	1 2	65 ⅄	24·82	185
„ (Clementhorpe)	J. R. Procter, Esq.	5	1 0	150 T	23·40	163
* „ (Whitley)	Rev. R. F. Wheeler	5	0 10	82 ⅄	23·84	...
„ (Convt. Home)	Charles Roope, Esq.	5	0 10	30	22·45	...
„ (Earsdon)	John Taylor, Esq.	5	2 10	185 T	23·34	149
Stamfordham	Rev. J. F. Bigge	8	1 0	400 T	26·51	...
Newcastle and Gateshead W. Works — Whittle Dean	Rev. R. F. Wheeler	...	...	...	27·00	...
Hallington	„ „ „	...	0 6	469 ⅄	30·62	...
„ (Fawcett)	„ „ „	...	0 6	563 ⅄	28·59	...
North Tyne (Green Crag)	„ „ „	...	0 6	800 ⅄	31·49	...
„ „ (Valley)	„ „ „	...	0 6	...	28·72	...
Gunnerton Burn (Camphill)	„ „ „	...	0 6	676 ⅄	29·24	...
Swinburn (Woodford)	„ „ „	...	0 6	500 ⅄	29·31	...
Bellingham (Hesleyside)	W. H. Charlton, Esq.	5	0 8	373	32·46	86
Hartburn (Wallington)	H. Laws, Esq, C.E.	5	1 0	398 ⅄	32·19	209
Falstone	Mr. M. Hedley	5	3 0	...	34·55	173
Morpeth (Cresswell)	Rev. J. E. Leefe	...	1 0	96 T	23·76	...
Kielder	Mr. W. Spence	5	1 6	600 ?	43·67	153
Rothbury (Brenckburn Priory)	C. H. Cadogan, Esq.	5	1 0	250 T	31·22	134
Deadwater	Mr. Scott	3	1 6	2000 T	42·80	...

Corrected to May 1872.

MAP OF BORDER COUNTIES.



DIVISION X.—NORTHERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
NORTHUMBERLAND—(*con.*)						
Rothbury (Cragside)	Rev. R. F. Wheeler	8	1 0	400 T	29·39	91
Alnwick (Glanton Pyke)	F. W. Collingwood, Esq	8	4 4	534 T	30·17	...
Howick	Earl Grey, K.G.	8	0 10	121 ⅄	25·52	99
Lilburn Tower	E. J. Collingwood, Esq	10	6 0	300 T	25·44	...
Wooler (Middleton Hall)	J. T. Leather, Esq. C.E.	10	2 0	240 ⅄	25·98	...
Bamburgh (North Sunderland)	Rev. F. R. Simpson	8	1 2	69 T	22·63	186
*Wooler (Milfield)	G. A. Grey, Esq.	5	0 9	200 ⅄	29·13	...
CUMBERLAND.						
Bootle Rectory	Rev. A. Wilkin	8	1 0	87 ⅄	40·91	171
Whitehaven (Braystones)	J. D. Watson, Esq	10	3 8	36 T	32·92	...
†Seathwaite ...*monthly*(11)	Mr. Birkett	8	1 0	422 T	109·75	...
,, ,,	,, ,,	4	0 6	422 T	103·25	...
† ,, ...*daily* (11)	,, ,,	5	1 0	422 T	115·15	...
St. Bees	W. C. Hughes, Esq.	8	1 6	100 ?	47·54	143
†Wythburn Parsonage *monthly*(20)	Rev. Basil Lawson	8	1 0	574 T	84·75	...
†Helvellyn (Birkside) ,, (21)	G. J. Symons, Esq.	8	1 0	1800 T	?92·25	...
†Watendlath ...(13)	,, ,, ,,	8	1 0	867 T	67·00	...
Keswick (Barrow House)...(B)	S. Z. Langton, Esq.	8	0 6	282 ⅄	59·10	198
Whitehaven (Millgrove) *monthly*	H. A. Fletcher, Esq.	8	1 6	220 T	37·55	...
,, (The Barracks)	Capt. Morris Fawcett	5	1 0	21 ⅄	37·61	181
Loweswater (Waterend)	R. Jackson, Esq.	5	0 8	432 T	44·79	174
†Hallsteads...(36)	A. Marshall, Esq.	10	4 0	490 T	45·10	...
†Gowbarrow Fell ...(29)	G. J. Symons, Esq.	8	1 0	1100 T	?49·90	...
† ,, (Watermillock) ...(37)	Mr. W. Rumney	10	3 6	720 T	45·80	168
Keswick (Deer Close) ...(F)	H. C. Marshall, Esq.	7	1 9	300 T	48·05	209
† ,, (Crow Park) ...(15)	,, ,, ,,	10	5 0	295 T	?38·40	...
† ,, (Derwent Island) ...(14)	,, ,, ,,	5	0 7	280 T	45·43	208
† ,, (Post Office) ...(16)	Mr. Crosthwaite	8	6 4	270 T	46·18	149
BA* ,, ,, ...(16)	,, ,,	5	1 0	270 T	43·91	149
†Skiddaw ...(18)	Mr. Nixon	8	1 0	1677	52·15	...
†Bassenthwaite (Mirehouse)	Mrs. Spedding	5	0 7	310 T	40·12	202
Cockermouth (Whinfell Hall)	W. Robinson, Esq.	5	2 0	265 ⅄	41·70	212
Workington (Stainburn)	C. Litt, Esq.	8	0 6	101 ⅄	33·56	178
,, (Park End)	W. Thompson, Esq.	5	1 1	124 T	31·34	185
Cockermouth	Dr. Dodgson	8	0 6	158 ⅄	36·89	167
,, (on a post)	,, ,, ,,	8	6 6	164 ⅄	35·09	...
,, (Higham)	T. A. Hoskins, Esq.	8	0 6	478 ⅄	36·65	197
Penrith	T. Lester, Esq.	5	4 0	...	23·75	140
Maryport (Netherhall)	H. P. Senhouse, Esq.	8	0 6	27 T	30·05	150
Silloth (The Rectory)	Rev. F. Redford	8	3 0	28 ⅄	30·64	164
Carlisle (Cemetery)	Mr. T. Bell	8	3 0	114 ⅄	28·12	...
,, (Scotby)	F. E. Sutton, Esq.	8	5 5	70 T	27·63	134
,, (Bunker's Hill)	T. Barnes, Esq., M.D.	12	6 0	184 ⅄	23·58	...
,, (Scaleby Hall)	R. A. Allison, Esq.	5	1 1	112 T	30·37	177

NOTE.—The numbers in parentheses on this and two following pages refer to the Map facing page 158 of *British Rainfall*, 1870.

DIVISION X.—NORTHERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	in.	Height Above Sea Level feet.	Depth of Rain. 1871 inches.	Days on which ·01 or more fell.
WESTMORELAND.							
Burton (Hutton House).....	Rev. T. B. Armitstead.	4	1	0	180 T	42·84	...
Kirkby Lonsdale (Casterton).....	S. Morris, Esq.	8	1	0	305 ⅄	42·11	190
„ „ („ *monthly*)	„ „	8	1	0	305 ⅄	42·40	...
„ „ (Biggins House)	Miss Tomlinson.....	12	3	6	400 ?	43·75	...
„ „ (Whelprigg) ...	Mrs. Gibson	5	4	6	475	45·13	...
„ „	Mr. W. Harrison	5	1	2	209	42·56	...
Crosthwaite (Churchtown)	W. Garnett, Esq.	5	1	3	150 ⅄	50·32	194
Kendal (Kent Terrace)	R. J. Nelson, Esq.....	5	1	6	146	50·25	186
„ (Highgate).....	E. Hayton, Esq.	8	5	0	180 T	51·47	193
„ (Underfell)	J. J. Wilson, Esq.....	8	4	0	300 T	49·28	176
Stavely (Middle Fairbank)	T. K. Atkinson, Esq...	10	3	0	...	59·24	191
Bowness (Bellsfield)	H. W. Schneider, Esq.	5	4	6	160 ⅄	51·07	130
„ (Matson's Grounds) ...	G. Healey, Esq.....	12	0	8	451 ⅄	59·35	195
Windermere (High House)	E. Hayton, Esq.....	8	4	0	636 T	54·02	...
„ (The Wood).....	G. B. Crewdson, Esq..	8	3	2	310 ⅄	60·19	184
Ambleside (The Nurseries) ...(D)	Mr. J. Grier	5	1	3	140	70·35	188
„ (Low Nook) .....(27)	Rev. S. Joy	8	3	0	160	71·54	192
„ (Lesketh Howe) ...(26)	F. M. T. Jones, Esq....	5	1	6	175 T	72·98	...
†Grasmere (High Close) .....(22)	E. B. W. Balme, Esq...	8	0	9	553	72·77	220
*Kirkby Stephen	T. Mason, Esq.	5	1	0	574 T	36·96	173
†Kirkstone Pass.....(34)	G. J. Symons, Esq. ...	5	1	0	1500 T	98·21	228
†Grasmere (Easedale Tarn) ...(A)	„ „ „	8	1	0	1175 T	92·00	...
†Haweswater(Mardale Green)(40)	„ „ „	8	1	0	800 T	83·40	...
†Shap (Crosby Ravensworth) (E)	Rev. G. F. Weston ...	8	0	5	600 T	51·38	158
†Haweswater(Measandbecks) (41)	G. J. Symons, Esq. ...	8	1	0	1200 T	48·25	...
†Patterdale Hall ..... (33)	Mr. Sinclair	7	2	0	490 T	76·39	172
Appleby	Dr. Armstrong	8	1	0	442 T	31·80	165
Ullswater (Martindale)	Rev. S. Gelding, M.A.	...	...		...	65·87	...
† „ (Swarth Fell).....(39)	G. J. Symons, Esq. ...	8	1	0	1000 T	43·75	...
„ (Sharrow Bay) *monthly*(38)	A. Parkin, Esq.....	5	0	7	500	38·85	...
„ „	„ „ „	8	1	6	500	37·00	...
†Great Strickland [Penrith] (44)	H. Plumer, Esq.....	5	1	6	650	38·12	186
†Brougham Hall [Penrith].....	Mr. G. Campbell	5	1	0	470 T	30·83	148

DIVISION XI.—MONMOUTH, WALES, AND THE ISLANDS.

MONMOUTH.							
*Newport(Llanfrechfa Grange) ...	F. J. Mitchell, Esq. ...	5	4	0	360 B	45·11	148
* „ (Cwmbrân Vicarage) ...	Rev. J. Rees Jenkins..	5	1	0	350	50·85	162
Chepstow (Tutshill)	J. G. Wood, Esq.	8	3	6	200 T	44·80	162
„ (The Mount)	H. Clay, Jun., Esq. ...	5	1	0	200 ?	42·43	148
Tintern Abbey.....	Mr. W. Bowen	5	1	0	16	44·99	166
Tredegar (Ebbw Vale)	P. James, Esq.	5	1	0	918	64·11	170
„ (Sirhowy)	R. Jordan, Esq.....	5	1	0	1055	54·41	196
Monmouth (Dingestow).....	S. R. Bosanquet, Esq.	5	1	0	300 ?	32·49	...
Abergavenny	**Dr. McCullough**	**5**	**1**	**0**	**220 B**	**36·80**	**170**

DIVISION XI.—MONMOUTH, WALES, AND THE ISLANDS—(*continued*).

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches	
GLAMORGAN.						
*Cowbridge (The Ham)	G. W. Nicholl, Esq.	8	1 3	50 ?	33·55	...
Cardiff (Ely)	T. G. South, Esq. C.E.	5	3 0	45	41·16	147
„ (Crockherbtown)	W. Adams, Esq.	5	1 0	35 ⅄	37·01	172
„ (Pentyrch)	F. G. Evans, Esq.	5	1 1	100 T	47·42	185
„ (Lisvane)	T. G. South, Esq. C.E.	5	2 0	142	42·30	164
Swansea (South Dock Lock)	J. W. James, Esq.	12	14 9	40 ⅄	32·69	160
Aberdare (Treherbert)	W. T. Lewis, Esq.	5	1 0	634 ⅄	81·60	192
„ (Mardy)	„ „ „	5	1 1	431 ⅄	61·35	195
MerthyrTydfil (Thomas Town)	T. J. Dyke, Esq.	5	4 0	550 ⅄	47·45	171
Ystalyfera	Dr. D. Thomas	8	1 2	220 ?	61·21	158
CARMARTHEN.						
Carmarthen (Gaol)	G. Stephens, Esq.	8	0 6	92 ⅄	52·12	197
„ (Joint Co. Asylum)	Dr. Hearder	8	0 6	185	51·36	200
Llangadock	F. Layard, Esq.	5	1 0	159 ⅄	44·72	...
Narberth (Tegfynydd)	H. S. Morgan, Esq.	5	1 0	158	47·75	134
PEMBROKE.						
Tenby (Ivy Tower)	John Leach, Esq.	5	...	180	46·99	205
Milford	Henry Edwards, Esq.	5	3 0	130 L	42·48	157
*Haverfordwest (High Street)	E. P. Phillips, Esq.	5	1 0	95 T	46·73	143
CARDIGAN.						
Aberystwith (Goginan) (58)	H. Trenwith, Esq.	5	2 6	290	37·47	...
„ (Capel Bangor) (57)	T. Paul, Esq.	5	1 0	42 B	36·76	164
„ (University College) (68)	Rev D. Charles	5	1 3	24	28·94	...
BRECKNOCK.						
Crickhowell (Glanusk Park)	Mr. Ireland	8	0 6	300 ?	34·23	...
Brecknock	J. Kirk, Esq.	5	2 0	437 ⅄	46·71	131
„ (Watton Mount)	George Overton, Esq.	5	2 0	450	41·29	93
Llanwrtydd (71)	Mr. S. J. B. Kelland	5	1 10	765 T	52·44	172
RADNOR.						
*Presteign	Captain Hannam	5	1 0	550	34·19	186
Rhayader (Nantgwillt) (70)	R. P. Lloyd, Esq.	...	1 0	...	52·68	179
† „ (Cefnfaes) (62)	Mrs. Jones	5	2 0	880 ⅄	43·93	169
†Heyhope Rectory	Rev. W. W. Griffith	5	1 0	690 T	38·71	175
MONTGOMERY.						
†Llanidloes (Ystrad-olwyn-fawr) (59)	Mr. J. Jones	8	1 0	950 T	39·30	...
† „ (Dolenog) (69)	T. F. Roberts, Esq.	5	2 0	550 T	39·99	141
Newtown (Dolfor)	W. B. Pugh, Esq.	...	...	...	40·38	...
†Dylive (Head of R. Clwyedog) (55)	Mr. Isaac Jones	8	1 0	1300 T	70·70	...
†Carno (Capel) (54)	Mr. T. Bound	8	1 0	550 T	40·30	...
Machynlleth (Plas)	Mr. Johnstone	5	1 0	...	50·69	182
†Garthbibio (Lluest fawr) (49)	Mr. J. Jones	8	1 0	990 T	53·80	...
†Llanwddyn (Head of Vyrnwy) (46)	Mr. J. Gittins	8	0 8	1740 T	71·50	...
FLINT						
Mold (Bryn Alyn)	Rev. R. B. Cooke	5	1 2	483 ⅄	32·61	...
†Hawarden [Chester]	Dr. Moffat	8	0 4	270	28·22	145
Holywell (Maes y dre)	J. Williams, Esq.	10	5 0	400	24·63	...
St. Asaph (Brynbella) (33)	P. P. Pennant, Esq.	5	1 0	280 B	27·96	...

NOTE.—The numbers in parentheses on this and the following pages refer to the Map facing page 156, of *British Rainfall*, 1870.

DIVISION XI.—MONMOUTH, WALES, AND THE ISLANDS—(*continued*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
DENBIGH.						
Ruabon (Wynnstay)	Mr. Middleton	12	3 0	484	37·33	193
Wrexham (Plas Power)	Mr. J. Clark	5	1 0	472 ⅄	31·31	183
„ (Nant-y-Frith)	T. V. Kyrke, Esq.	5	4 0	850	36·02	...
„ (Brymbo)	C. E. Darby, Esq.	6	6 3	632 L	28·23	...
Rosset (Trevalyn Hall)	Capt. Griffith	5	1 0	58 ⅄	27·46	191
St. Asaph (Llannerch)	Whitehall Dod, Esq.	5	1 1	107 ⅄	27·12	180
MERIONETH.						
*Dolgelly (21)	Major Mathew	5	1 0	43	56·03	188
ℬ* „ (Brithdin) (28)	J. Hill, Esq.	5	1 6	500 ?	60·67	...
Bala (20)	Major Mathew	5	1 0	544	45·96	200
Trawsfynydd (4)	„ „	5	0 7	700	53·02	196
*Festiniog (Blaenyddol) (3)	„ „	5	1 0	600	64·22	188
*Rhiw brifdir (15)	„ „	5	10 0	1100	79·94	219
CARNARVON.						
Aberdaron (Sarn) (22)	Mr. W. Jones	12	5 0	356 ⅄	45·01	187
*Pwllheli (Bodfaen) (17)	Major Mathew	5	4 9	80	38·76	192
*Llanystumdwy (Talarvor) (16)	„ „	5	3 0	50	26·42	146
*Llangybi (Cefn) (6)	„ „	5	1 1	200	43·68	178
*Port Madoc (1)	„ „	5	3 0	10	40·45	174
Beddgelert (Bryn Gwynant) (66)	J. Wyatt, Esq.	9	3 0	264 B	110·89	189
ℬ Pen-y-gwryd	Mr. Henry Owen	8	1 0	...	99·43	...
*Llanllyfni (Cilgwyn) (13)	Major Mathew	5	1 0	900	44·83	141
Carnarvon (Cocksidia) (39)	„ „	5	1 1	120	33·48	200
* „ (Plas Brereton) (7)	T. Turner, Esq.	5	1 0	25	34·42	215
*Bethesda (Penrhyn Quarry) (11)	Major Mathew	5	5 0	1000	50·91	206
„ (Brynderwen) (12)	„ „	5	1 0	550	43·68	198
†Llanfairfechan (26)	R. Luck, Esq.	5	0 8	150 B	33·75	131
†Llandudno (Warwick House) (29)	Dr. Nicol	8	0 8	99 ⅄	30·56	163
„ (Great Orme's Head) (64)	R. Price, Esq.	12	6 0	175 ?	24·90	...
ANGLESEA						
Menaifron (23)	Rev. W. W. Williams	5	4 9	20 L	31·68	200
ISLE OF MAN.						
Calf of Man	Bd. of Northern Lights	...	...	...	29·23	106
Douglas Head	„ „ „	...	0 6	...	36·41	99
„ (Derby Square)	P. Killey, Esq.	5	1 1	88 L	42·66	185
ℬ Kirk Michael	Rev. W. C. Ingram	5	1 0	100 ?	34·00	..
Point of Ayre	Bd. of Northern Lights	...	3 4	27 ?	24·21	124
ISLES OF SCILLY.						
St. Mary's	*R. Corn. Pol. Soc. Rep.*	...	...	...	34·55	...
„ (The Parade)	J. G. Moyle, Esq.	5	1 0	20	36·65	...
GUERNSEY.						
Guernsey	Dr. Hoskins, F.R.S.	12	12 0	204 B	36·26	168
„ (Grange Road)	Dr. Mansell	5	1 0	174 B	36·32	195
ALDERNEY.						
Alderney Harbour Works	L.F.V.Harcourt,Esq.	12	10 0	48 ⅄	27·18	179
SARK.						
Sark Parsonage	Rev.T.L.V.Cachemaille	5	1 0	340 L	31·32	167

SCOTLAND.

DIVISION XII.—SOUTHERN COUNTIES.

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Rain Gauge. Height Above Ground.	Rain Gauge. Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
WIGTOWN.						
Mull of Galloway	Bd. of Northern Lights	...	...	...	24·22	109
BA*Wigton (N. Balfern)	T. MacLelland, Esq....	5	0 11	75 ⅄	45·56	183
Stranraer (South Cairn)	Mr. J. Kennedy	8	1 4	209	56·15	149
Corsewall	Bd. of Northern Lights	...	3 4	22 ?	34·88	151
KIRKCUDBRIGHT.						
Little Ross	Bd. of Northern Lights	...	3 3	130 ?	27·60	119
Twynholm (Cally)	A. Buchan, Esq.	5	...	90	48·07	...
BA*Dalbeattie	J. Grieve, Esq.	5	0 8	25 ?	46·01	163
Cargen [Dumfries]	P. Dudgeon, Esq.	3	0 4	80 ⅄	44·54	149
New Galloway	R. McKay, Esq.	8	20 0	220 T	47·89	184
BA*Carsphairn	J. Hannah, Esq.	5	3 10	574 T	57·41	144
DUMFRIES.						
Annan (Warmanbie)	D. A. Carruthers, Esq.	8	3 0	100	38·76	185
Dumfries (Crichton Asylum)	Dr. Gilchrist	8	0 6	154 T	37·93	153
„ (March Hill Cott.)	Mr. T. Hogg	5	1 0	70 T	35·32	170
Thornhill (Wallace Hall)	C. T. Ramage, Esq.	3	0 10	207 T	33·30	...
Drumlanrig Castle	A. Buchan, Esq.	3	0 6	191	41·90	...
Kirkpatrick Juxta (Broomlands)	Mr. Burgess	3	0 2	346	54·10	143
Langholm	J. Little, Esq.	3	2 0	270 T	52·55	...
Westerkirk School	„ „	3	2 0	420 T	50·80	...
Eskdale. Byerburnfoot	„ „	3	2 0	140 T	48·40	...
Eskdale. Ewes School	„ „	3	0 6	407 T	44·10	...
Eskdale. Carlesgill	„ „	10	2 0	370 T	52·20	...
Eskdale. Eskdalemuir School	„ „	3	0 6	412 T	52·40	...
ROXBURGH.						
New Castleton (The Flatt)	J. Elliot, Esq.	3	0 9	350 T	49·40	...
„ „ (Kirndean)	Miss Elliot	3	0 9	400 T	45·60	...
Saughtree	Rev. R. F. Wheeler....	5	4 0	700	39·76	194
Hawick (Wolfelee)	A. Buchan, Esq.	...	...	...	37·30	...
„ (Langraw)	Mr. W. Oliver	5	0 6	570 ⅄	32·15	...
„ (Kirkton)	Mr. J. Welsh	...	1 0	759 ⅄	31·00	...
„ (Goldielands)	Dr. Elliot	...	0 8	505	35·60	..
„ (Borthwickbrae)	A. E. Lockhart, Esq...	8	0 2	800 T	37·80	...
„ (Lynnwood)	*Hawick Advertiser*	...	0 6?	387	28·70	...
* „ (Silverbut Hall)	Mr. D. Elder	5	4 0	512 ⅄	28·50	170

DIVISION XII.—SOUTHERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Rain Gauge. Height Above Ground.	Rain Gauge. Height Above Sea Level	Depth of Rain. 1871	Days on which .01 or more fell.
			ft. in.	feet.	inches.	
ROXBURGH—*(con.)*						
*Jedburgh (Sunnyside)	G. Hilson, Jun., Esq.	5	10 0	360 ⅄	26·98	124
Kelso (Springwood Park)	Sir G. Douglas, Bt	10	1 0	130	25·47	170
Melrose (Dingleton Mains)	R. Paulin, Esq.	5	5 0	650	32·96	172
Wooplaw [Galashiels]	J. Murray, Esq.	5	0 9	880 ⅄	29·72	196

DIVISION XIII.—SOUTH-EASTERN COUNTIES.

SELKIRK.						
Bowhill	A. Buchan, Esq.	6	11 0	537	31·23	156
Galashiels	Dr. Somerville	5	0 4	416 ⅄	30·88	188
PEEBLES.						
Glenrath	Mr. S. Linton	5	1 2	764 ⅄	36·97	160
Cairnmuir	A. Buchan, Esq.	12	0 5	1150	47·24	...
Penicuick (N. Esk Reservoir)	Mr. J. Garnock	11	0 6	1150 ⅄	34·30	138
BERWICK.						
Marchmont House	Mr. P. Loney	5	1 0	500 ⊺	35·64	213
Lauder (Thirlestane Castle)	Mr. J. Whitton	3	0 3	558 ⊺	31·60	...
Dunse (Mungo's Walls)	Mr. J. Thomson	3	0 6	267	29·28	177
St. Abb's Head	Bd. of Northern Lights	...	0 4	211 ?	20·21	95
HADDINGTON.						
Yester	A. Buchan, Esq.	12	1 0	425	30·98	...
Haddington (Millfield)	Mr. T. Dods	6	4 0	140 ⊺	25·42	...
Tranent (Tyneholme)	A. Buchan, Esq.	...	...	284	27·34	...
Dunbar (Thurston)	„ „	6	4 0	327	26·70	...
East Linton	Mr. J. Storie	3	0 3	90 ⊺	25·62	156
Drem (Fenton Barns)	G. Hope, Esq.	3	1 0	103 ⊺	27·18	...
North Berwick (Seacliffe)	A. Buchan, Esq.	8	5 0	80	23·40	...
EDINBURGH.						
Cobbinshaw Reservoir	A. Buchan, Esq.	6	0 7	863	36·40	...
Harlaw	W.H.Cameron Esq.C.E.	...	...	...	34·90	...
Glencorse	„ „ „	...	0 6	787	34·35	131
Clubbiedean	„ „ „	...	...	...	36·50	...
Swanston	„ „ „	...	0 6	555	34·73	...
Colinton (Fernielaw)	J. Leslie, Esq., C.E.	11	0 6	500	35·20	...
†Dalkeith	A. Buchan, Esq.	4	0 4	183	25·60	...
Ratho (Bonnington)	„ „ „	3	4 0	405	27·70	...
Inveresk	Mr. McAuslane	9	2 0	60 ⊺	30·42	146
Edinburgh (March Hall)	A. Buchan, Esq.	5	0 3	170	28·10	...
„ (Princes St.)	„ „ „	6	7 6	220	23·24	...
„ (Charlotte Square)	J. Leslie, Esq., C.E.	11	0 6	230	26·87	...
„ („ „)	„ „	12	63 0	300	17·39	...
Costorphine (Meadowfield)	A. Paterson, Esq.	8	9 4	155 ⊺	25·61	...
Leith	A. Buchan, Esq.	...	...	...	26·01	194
Inchkeith	Bd. of Northern Lights	..	...	...	28·70	82
LINLITHGOW.						
Linlithgow (Rockville)	A. Buchan, Esq.	10	5 0	...	31·02	...

DIVISION XIV.—SOUTH-WESTERN COUNTIES.

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	in.	Height Above Sea Level feet.	Depth of Rain. 1871 inches.	Days on which ·01 or more fell.
LANARK.							
Douglas (Newmains)	Mr. J. Russell	3	0	4	783 ⅄	42·09	161
Uddingston (Meadowbank)	J. Anderson, Esq.	5	15	0	75 ⅄	27·30	...
Lanark (Baronald)	Captain Thornton	5	1	0	505 ⅄	32·31	189
„ (Sunnyside)		5	1	8	384 T	33·36	151
„ (Ridge Park)	C. Lindsay, Esq.	5	0	4	630 ⅄	33·71	165
Carnwath	Mr. W. Currie	3	0	1	700 T	33·24	178
Hamilton (Auchinraith)	R. Ker, Esq.	8	4	9	150 ?	32·02	...
„ (Bothwell Castle)	Mr. A. Turnbull	10	18	0	146 T	28·22	166
Cambuslang (Bushy Hill)	Dr. Muirhead	6	0	10	147 ⅄	34·58	187
Glasgow (Cessnock Park)	R. Hart, Esq.	10	4	4	29 ⅄	34·00	200
„ (Observatory)	Professor Grant, F.R.S.	5	0	1	180 ⅄	40·54	203
Baillieston	Mr. P. Jarvie	6	0	3	230 T	45·69	205
Shotts (Hillend House)	Mr. J. Ritchie	10	7	0	620	26·53	193
Woodside House (Coatbridge)	Joseph Baker, Esq.	5	1	1	275 ⅄	31·59	180
AYR.							
Girvan (Pinmore)	Captain Hamilton	5	1	0	187 T	47·83	207
Patna (Hole House)	Mr. P. Murdoch	5	1	0	441 ⅄	38·81	189
New Cumnock (Whitehills)	W. Lennox, Esq.	5	1	0	860 ⅄	43·53	198
Ayr (Auchendrane House)	E. Cathcart, Esq.	8	2	3	96 ⅄	40·17	205
„ „ (in a pit)	„ „	5	0	0	94 ⅄	40·96	205
Old Cumnock	J. Ballantine, Esq	6	1	3	380 ⅄	35·20	...
Muirkirk (Irondale House)	J. Wilson, Esq.	5	1	0	735 ⅄	40·28	192
Kilmarnock (North Craig)	J. M. Gale, Esq., C.E.	12	0	6	330 ?	37·03	...
„ (Annanhill)	A. Buchan, Esq.	10	4	0	175	33·33	...
Irdrossan	„ „ „	8	1	0	...	40·60	...
Largs (Mansfield)	Dr. Campbell	10	0	6	30	42·80	...
Kelmorlie (Morland)	A. Buchan, Esq.	...	...		100	52·70	...
RENFREW.							
District. Ryat Lynn	‡Glasgow Water Works	8	0	5	310	46·60	...
Waulk Glen	„ „ „	12	0	5	280	46·15	...
Middleton	„ „ „	12	0	5	550	50·70	...
Nither Cairn (Black Loch)	„ „ „	...	...		...	52·70	...
Cearns (Newton)	P. R. Murdoch, Esq.	5	1	0	350	44·07	...
„ (Netherplace)	W. Mather, Esq.	4	0	6	360 T	47·88	...
Stanely Reservoir	Robert Sharp, Esq.	12	1	0	190	38·29	...
Muirhead	„ „	11	1	0	482	46·47	...
Springside	„ „	11	1	0	532	51·04	...
Haws W. Works (Loch Thom)	J. Wilson, Esq.	6	0	9	643 ⅄	62·70	...
„ „ (Compen. Res.)	„ „ „	6	0	9	616 ⅄	61·70	...
„ „ (Shiel Hill)	„ „ „	6	0	9	962 ⅄	62·70	...
„ „ (Spango Burn)	„ „ „	6	0	9	757 ⅄	56·20	...
Greenock (Hamilton Street)	Mr. Anderson	6	0	6	64	62·31	228

‡ Information supplied by J. M. Gale, Esq., C.E.

DIVISION XV.—WEST MIDLAND COUNTIES.

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Rain Gauge. Height Above Ground.	Rain Gauge. Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
DUMBARTON.						
Cardross (Kilmahew Castle)	J. W. Burns, Esq.	3	0 2	96 T	48 85	158
Loch Lomond (Cameron House)	A. Buchan, Esq.	...	...	...	62·40	...
„ „ (Balloch Castle)	A. J. D. Brown, Esq.	7	0 4	91 T	48·53	207
„ „ (Firkin)	A. McDowall, Esq.	3	0 6	100	97·80	...
Loch Long (Arddaroch)	J. White, Esq.	5	0 10	80	71·40	188
STIRLING.						
Strathblane (Mugdock Reservoir)	Glasgow Water Works	8	0 6	320	46·80	...
Falkirk (Kerse)	Earl Zetland, K.T.	8	1 0	...	32·20	...
„ (Arnott Hill)	A. Buchan, Esq.	5	1 6	135	35·58	...
Stirling (Polmaise Gardens)	Mr. Gorrie	6	0 2	12	38·10	...
BUTE.						
Pladda	Bd. of Northern Lights	...	3 3	55 ?	37·18	178
ARGYLL—(MAINLAND.)						
Castle Toward	Mr. Scath	6	4 0	65	48·10	..
Loehgilphead (Kilmory) *Thom's g.*	Sir J. P. Orde, Bart.	6	0 4	100	56·30	...
„ (Callton Môr)	Mr. J. Russell	3	4 6	65	52·28	247
Loch Fyne (Cairndow No. I.)	A. McDowall, Esq.	3	0 6	25	83·09	...
„ „ („ No .II.)	„ „	8	0 6	25	80·87	...
Inverary Castle	Mr. J. Caie	4	0 1	30	41·50	...
Dalmally (Bridge of Orchy)	A. McDowall, Esq.	3	0 6	700 ?	137·82	...
Oban	A. Buchan, Esq.	5	1 6	10	64·64	...
Appin (Aird's)	R. Macfie, Esq.	6	0 3	15 ?	50·70	...
BA Ballachulish	Rev. D. McKenzie	5	1 1	25	83·59	166
Loch Sunart (Glenborrodale)	J. J. Dalgleish, Esq.	5	0 2	6 L	58·30	193
Loch Eil (Corran)	Bd. of Northern Lights	...	0 4	14 ?	65·25	128
Ardnamurchan	„ „ „	...	3 6	82 ?	37·61	162
ARGYLL—(INSULAR.)						
Cantire, Mull of	Bd. of Northern Lights	...	...	279 ?	45·77	107
„ Campbeltown (Devaar)	„ „ „	...	3 4	75 ?	45·00	176
Skipness Castle	Mrs. Graham	6	1 6	20 L	39·70	...
Tarbert (Stonefield)	Colin G. Campbell, Esq.	3	1 3	90	67·89	172
*Islay (Lochindaul)	Bd. of Northern Lights	...	...	...	44·31	170
* „ (Eallabus)	R. Ballingal, Esq.	5	1 0	67 L	45·52	209
„ (Rhinns)	Bd. of Northern Lights	..	3 0	74 ?	34·76	178
Jura (Lowlandmansbay)	„ „ „	..	...	...	47·39	181
„ (Fladda)	„ „ „	...	...	...	51·33	116
Lismore (Mousedale)	„ „ „	..	3 4	37 ?	35·78	154
Mull (Glengorm)	Miss Forsyth	6	0 9	200 ?	43·20	...
„ (Sound of Mull)	Bd. of Northern Lights	...	0 6	12 ?	89·20	186
Tyree (Hynish)	„ „ „	...	...	...	57·38	130
BA* „ (Heynish Farm)	L. Macquarie, Esq.	5	0 9	65	42·28	159

DIVISION XVI.—EAST MIDLAND COUNTIES.

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Rain Gauge. Height Above Ground.	Rain Gauge. Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
CLACKMANNAN.						
Dollar	Mr. Westwood	7	0 6	174 ⅄	41·99	109
KINROSS.						
Loch Leven Sluice	Mr. P. Farnie	...	0 10	...	34·10	...
FIFE.						
Burntisland	Rev. G. H. Forbes	...	...	...	31·66	184
Dunfermline (Craigluscar)	W. Chisholm, Esq.	10	0 10	400	37·70	...
Balfour	Mr. J. Dewar	3	0 6	127 T	34·14	146
Leven (Nookton)	W. McG. Miller, Esq.	5	0 6	80 ⅄	30·96	187
Isle of May	Bd. of Northern Lights	...	2 2	182 ?	21·59	78
St. Andrews (Cambo House)	Sir T. Erskine, Bt.	3	0 8	50 T	27·20	...
ℬ Auchtermuchty	Dr. Troup	5	1 0	179 ⅄	34·53	191
St. Andrews (Feddinch Mains)	Mr. Muirhead	3	1 0	300 T	29·13	161
Cupar (Birkhill)	Mrs. Wedderburn	5	0 5	130 B	28·04	...
PERTH.						
Culross (West Grange)	J. J. Dalgleish, Esq.	5	0 2	116 ⅄	39·59	126
Menteith (Cardross House)	H. D. Erskine, Esq.	8	1 0	120 L	50·60	...
Aberfoyle	Glasgow Water Works	8	0 6	60	60·60	...
Ledard	„ „ „	...	...	1500	58·80	...
Dunblane (Kippenross)	J. Stirling, Esq.	6	0 4	100	32·40	...
Deanston House	J. Finlay, Esq.	6	0 4	130 ⅄	41·81	199
Loch Dhu	Glasgow Water Works	8	0 6	325	77·50	...
„ Drunkie	„ „ „	8	0 6	420	70·70	...
„ Vennachar	„ „ „	8	0 6	275	56·10	...
Lanrick Castle	A. Glover, Esq.	3	0 0	...	40·90	125
Bridge of Turk	Glasgow Water Works	8	0 6	270	64·10	...
Loch Katrine (Tunnel Hill Top)	„ „ „	8	0 6	830	70·00	...
Callander (Leny)	J. B. Hamilton, Esq.	3	0 3	340 ⅄	59·60	...
Between Glen Finlas & Ben Ledi	Glasgow Water Works	8	0 6	1800	54·90	...
Glen Gyle	„ „ „	...	...	380	90·10	...
Auchterarder House	Colonel Hunter	8	2 3	162	31·85	...
„ (Colquhalzie)	J. S. Hepburn, Esq.	8	0 5	150 ?	41·56	...
„ (Trinity Gask)	Mr. R. Wylie	3	0 1	133 ⅄	34·69	152
Loch Earnhead	A. Buchan, Esq.	3	0 4	460	62·00	...
„ (Stronvar)	D. Carnegie, Esq.	...	...	...	75·57	...
Perth Academy	Dr. Miller, F.R.S.E.	15	64 5	83 ⅄	21·35	...
„ (Inchbank)	„ „	10	1 6	24 ⅄	30·13	...
Scone Palace	Mr. J. Halliday	6	2 6	80 L	29·67	168
Meigle (Belmont Castle)	Mr. J. Davidson	8	37 0	237	27·00	...
Blairgowrie (Rosemount)	R. Geekie, Esq.	8	6 1	300 ⅄	26·15	139
† Aberfeldy (Bolfracks)	J. F. Wyllie, Esq.	12	0 6	360	38·20	...
„ (Blackhill)	J. S. Hepburn, Esq.	3	0 4	820	31·55	...
ℬ *Logierait (Strath-tay)	Rev. G. D. R. Munro	5	1 0	313 ⅄	29·26	170
Pitlochrie (Bonskeid)	A. Buchan, Esq.	...	...	...	26·84	...
FORFAR.						
† Dundee (Hermon Hill)	R. Adamson, Esq.	11	0 9	118 T	29·99	...
† „ (Westfield Cottage)	C. Clark, Esq.	5	5 6	50 T	25·78	179
† „ (Eastern Necropolis)	Mr. W. R. McKelvie	3	0 5	167 T	28·65	136

DIVISION XVI.—EAST MIDLAND COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground.	Height Above Sea Level	Depth of Rain. 1871	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	
FORFAR—(*con.*)						
†Barry Village	Mr. J. Proctor	12	0 3	35 ⅄	33·64	190
†Craigton (*daily*)	‡Dundee Water Works	5	...	481	41·55	121
† „ (*monthly*)	„ „ „	11	0 3	481	40·41	...
†Crombie Reservoir	„ „ „	11	0 3	522 T	39·07	...
Kettins	Mr. J. Gibb	4	1 0	218 ⅄	33·62	149
†Hill Head (*monthly*)	Dundee Water Works	11	0 3	570 T	39·15	...
Arbroath	A. Brown, Esq., LL.D.	8	2 0	60 T	26·69	139
Montroseness	Bd. of Northern Light	...	. .	...	25·85	91
Montrose (Bridge Street)	D. Scott, Esq.	11	0 3	25 T	26·81	...
„ (Museum)	A. Buchan, Esq	5	29 0	37 T	24·87	94
„ (Sunnyside)	„ „ „	...	...	200	33·74	...

DIVISION XVII.—NORTH EASTERN COUNTIES.

KINCARDINE.						
Lawrencekirk (Johnstone Lodge)	A. Buchan, Esq	5	...	382	34·12	...
Brechin (The Burn)	Col. McInroy	6	0 4	235 T	33·20	...
Fettercairn	A. C. Cameron, Esq.	3	0 3	230 ⅄	31·90	...
„ (Arnhall)	J. Vallentine, Esq	6	0 2	240	29·10	...
Girdleness [Aberdeen]	Bd. of Northern Lights	...	4 7	86	20·61	111
ABERDEEN.						
Braemar	Mr. J. Aitken	8	1 0	1114 T	30·35	182
Ballater	J. W. Paterson, Esq.	5	1 0	656 ⅄	26·59	108
Drumoak (Drum Castle) *monthly*	Mr. G. Gammie	5	1 8	275 ⅄	31·24	...
Cromar (Logie Coldstone School)	Rev. J. G. Michie	5	4 0	608 ⅄	28·01	166
„ („ „ Manse)	Rev. G. Davidson	5	1 0	694 T	24·27	...
„ (Tillyfourie)	A. Buchan, Esq	...	...	1120	23·85	...
Aberdeen (Pitmuxton)	Mr. J. Taylor	10	1 4	14	27·60	252
„ (Seafield Cottage)	Rev. A. Beverley	5	1 0	197 ⅄	28·94	202
„ „ „ (*monthly*)	„ „ „	5	1 0	197 ⅄	29·92	...
† „ (Rose Street)	A. Cruickshank, Esq.	8	0 4	95 T	25·18	...
* „ (Grammar School) „	Rev. A. Beverley	5	4 8	99 ⅄	28·15	...
„ „ „ *monthly*	„ „ „	5	1 6	96 ⅄	28·40	...
„ („ „) „	„ „ „	5	63 10	161 ⅄	26·89	...
Midmar (Blackstock)	Mr. J. Barron	5	0 8	570 T	27·70	169
Lumphanan (Corse House)	Mr. J. Hay	5	3 0	833 T	27·28	132
℣A*Alford (Bogside, Leochel C.)	W. Bruce, Esq.	5	3 0	882 ⅄	29·37	183
Inverury (Kenmay)	Rev. G. Peter	8	0 4	300	30·08	...
„ „	„ „ „	8	0 7	300	27·35	...
„ (Manse)	Rev. J. Davidson	9	0 4	220 T	29·83	...
Ellon (Tillydesk)	W. Hay, Esq.	11	0 4	349 T	28·84	...
Peterhead (Buchanness)	Bd. of Northern Lights	...	...	...	20·09	79
Old Deer	J. Walker, Esq.	5	2 0	155	29·05	206
„ „ (Manse)	Rev. J. Peter	8	0 6	154 ⅄	27·58	...
Turriff (New Byth)	A. Henderson, Esq.	5	0 5	391 ⅄	34·24	...
New Pitsligo	Mr. D. Sturrock	3	0 3	501 ⅄	30·32	180
Kinnairdhead	Bd. of Northern Lights	...	3 4	64?	34·65	113

‡Information supplied by J. Watson, Esq.

DIVISION XVII.—NORTH EASTERN COUNTIES—(*continued.*)

STATIONS.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground ft.	in.	Height Above Sea Level feet.	Depth of Rain. 1871 inches.	Days on which ·01 or more fell
BANFF.							
BA Tomintoul	Mr. R. Dey	5	1	0	1100 A	30·84	196
Rothiemay (Milltown)	Charles Pirie, Esq.	5	1	1	266	29·29	188
Gordon Castle	Mr. Webster	8	1	6	70	28·83	...
ELGIN OR MORAY.							
Grantown	Mr. W. Duncan	5	1	1	712 T	27·27	178
Elgin (Ashgrove)	W. Topp, Esq.	8	0	3	33	23·71	...
„ (Institution)	Mr. J. Martin	6	0	6	50 T	28·16	145
Covesea Skerries	Bd. of Northern Lights	...	...		...	17·76	135
NAIRN.							
BA Nairn	J. H. Browne, Esq.	5	1	6	55 A	22·76	169
Nairn	Mr. Penny	...	...		...	23·03	...

DIVISION XVIII.—NORTH-WESTERN COUNTIES.

WEST ROSS.‡							
*Loch Alsh (Inverinate House)	Mrs. Matheson	5	3	0	150	58·94	154
„ (Duncraig)	Mr. Graham	5	1	0	124 L	52·38	230
BA Applecross Gardens	Mr. W. Whitelaw	5	0	9	60?	52·40	202
Strathconan	Mr. J. Watson	5	2	0	...	40·50	263
BA Gairloch (Auchtercairn)	Mr. K. Mackenzie	5	1	0	...	47·05	163
Loch Vraon	J. W. Baldry, Esq.	8	0	5	750	39·35	...
Lochbroom (Loch Drome)	„ „	8	0	5	850	46·23	...
Braemore House	„ „	8	0	5	750	42·46	...
„ Lodge	„ „	8	0	5	100	43·78	...
BA*Lochbroom	Mr. M. Macleay	5	0	8	48	37·49	208
Isle of Lewis (Stornoway)	Bd. of Northern Lights	...	3	4	31?	27·81	153
„ (Lewis Castle)	Mr. Smith	5	0	8	60	26·07	239
„ (Bernera)	Mr. J. Macdonald	5	0	6	100	52·10	...
„ (Butt of Lewis)	Bd. of Northern Lights	...	3	6	...	34·11	187
EAST ROSS.‡							
BA*Dingwall Academy	J. Boyd, Esq.	5	1	0	25 T	22·19	128
Cromarty	Bd. of Northern Lights	...	3	4	28?	20·87	95
*Invergordon Castle	B. B. Æ. McLeod, Esq.	5	2	6	20?	21·33	146
Alness (Ardross Castle)	Mrs. Matheson	5	1	0	450	33·80	173
BA*Tain (Fearn)	Mr. M. McLean	5	1	3	50?	24·38	136
„ (Springfield)	Mr. McLardy	5	1	2	80 T	29·80	182
Tarbetness	Bd. of Northern Lights	...	3	4	61?	16·61	95
WEST INVERNESS.							
Loch Sheil (Glenfinnan)	A. Buchan, Esq.	...	...		35?	98·02	...
Loch Nevis (Inverie)	Mr. N. Macdonald	5	2	6	14	66·00	148
Glenquoich	Mr. G. Craig	8	4	8	576	90·00	...
Isle of Skye (Oronsay)	Bd. of Northern Lights	...	0	6	15?	49·48	162
„ (Kyle Akin)	„ „ „	...	0	2	3?	61·70	139
BA „ (Sligachan)(*monthly*)	Mr. Angus Macdonald	8	1	0	...	101·00	...
„ (Raasay)	Mr. T. Bunning	12	1	4	80	70·10	145
BA* „ (Portree)	Mr. J. Grant	5	1	8	85	79·19	257
„ (Dunvegan)	A. McDowall, Esq.	3	0	1	16	74·85	243

‡ Including Cromarty.

DIVISION XVIII.—NORTH-WESTERN COUNTIES—*(continued.)*

STATION.	AUTHORITIES.	Rain Gauge. Diameter.	Rain Gauge. Height Above Ground.	Rain Gauge. Height Above Sea level	Depth of Rain. 1871	Days on which .01 or more fell.
			ft. in.	feet.	inches.	
WEST INVERNESS—*(con.)*						
Rona	Bd. of Northern Lights	...	...	...	48·42	169
Barrahead	„ „ „	...	3 0	640 ?	30·89	162
S. Uist (Ushenish)	„ „ „	...	0 4	157 ?	37·86	208
N. Uist (Monach)	„ „ „	...	...	...	42·20	153
Loch Maddy (Spanish)	C. Shaw, Esq.	...	...	...	54·43	...
Harris (Island Glass)	Bd. of Northern Lights	...	3 4	50 ?	42·57	164
EAST INVERNESS.						
ℬ𝔄*Laggan	Mr. A. McIntosh	5	0 9	821 ⅄	32·30	176
Strath Errick (Farraline House)	Capt. Fraser	3	0 6	700 B	25·00	...
Glen Urquhart (Corrimony)	T. Ogilvy, Esq.	4	0 6	537 ⅄	34·80	178
Glen Strathfarrer	Mr. D. Fraser	5	1 0	461	48·69	222
*Beauley (Beaufort Castle)	Mr. W. Anderson	5	1 0	50	26·88	155
†Inverness (Culloden House)	A. Forbes, Esq.	7	3 0	82 T	20·76	
Cawdor [Nairn]	J. Joss, Esq.	5	1 0	260	27·35	184

DIVISION XIX.—NORTHERN COUNTIES.

SUTHERLAND.						
ℬ𝔄*Invershin	Mr. G. Young	5	4 0	20	20·18	...
Golspie (Dunrobin Castle)	Mr. J. Mitchell	3	0 3	6 T	24·75	194
Lairg	A. Buchan, Esq.	3	...	458	34·67	133
ℬ𝔄*Helmsdale	Mr. J. Campbell	5	1 0	34	28·61	...
Scourie	J. Simpson, Esq.	3	0 3	26	40·50	...
Cape Wrath	Bd. of Northern Lights	...	3 6	355 ?	33·12	154
CAITHNESS.						
Wick (Pulteney House)	Capt Rutherford, R.N.	5	6 0	76	19·17	134
„ (Nosshead)	Bd. of Northern Lights	...	3 4	127 ?	18·91	132
Thurso (Holburnhead)	„ „ „	...	0 4	60 ?	23·30	83
Pentland Skerries	„ „ „	...	3 3	72 ?	21·36	148
ORKNEY.						
South Ronaldsay (Roeberry)	J. Gray, Esq	5	1 2	150 ?	27·64	231
Hoy (Cantickhead)	Bd. of Northern Lights	...	...	...	19·56	63
„ Graemsay Sound (East)	„ „ „	...	3 4	27 ?	33·22	143
„ „ (West)	„ „ „	...	...	37 ?	18·53	89
ℬ𝔄*Pomona (Holm Manse)	Rev. O. Scott	5	1 4	30 ?	30·12	...
† „ (Kirkwall)	Mr. J. G. Iverach	3	0 4	8	37·13	198
„ (Tankerness)	A. Buchan, Esq.	5	...	...	35·16	...
Shapinsay (Balfour Castle)	D. Balfour, Esq.	4	0 6	50	26·40	...
†Pomona (Sandwick)	Rev. C. Clouston, LL.D.	11	2 0	78	32·17	...
Stronsay (Auskerry)	Bd. of Northern Lights	...	...	...	26·30	66
Sanda (Start Point)	„ „ „	11	0 6	29 ?	38·64	110
ℬ𝔄*Papa Westray	Rev. C. Clouston, LL.D.	5	...	80 ?	32·47	...
North Ronaldsay	Bd. of Northern Lights	...	3 4	21 ?	17·04	68
SHETLAND.						
Sumburghead	Bd. of Northern Lights	...	3 4	265 ?	23·69	125
Bressay Lighthouse	„ „ „	5	0 4	60	33·84	124
„ Manse ..... *monthly*	Rev. Dr. Hamilton	8	1 0	10	38·10	...
Stourhead	Bd. of Northern Lights	...	...	...	32·60	133
ℬ𝔄*East Yell	Mr. A. D. Mathewson	5	1 0	178 L	50·88	292

IRELAND.

DIVISION XX.—MUNSTER.

STATION.	AUTHORITIES.	Rain Gauge. Diameter.	Height Above Ground. ft.	in.	Height Above Sea level feet.	Depth of Rain. 1871. inches.	Days on which ·01 or more fell.
CORK.							
Cork (Queen's College)	Professor England	10	6	0	65	45·38	190
„ (Royal Institution)	Dr. Caulfield	10	50	0	70	35·66	169
Fermoy	A. Campbell, Esq.	10	4	0	114 ⅄	35·56	191
KERRY.							
ℬ𝔄Darrynane Abbey	D. O'Connell, Esq.	5	1	1	12	53·26	237
ℬ𝔄*Killarney(Kenmare Gardens)	Mr. Breese	5	4	0	100 T	62·72	205
WATERFORD.							
Waterford (Newtown)	Mr. E. Garnett	10	4	0	60 ?	44·67	223
„ (Curraghmore)	Mr. J. Anderson, Jun.	5	4	6	70	56·86	228
„ (Portlaw)	S. B. Pim, Esq.	24	25	0	50	44·49	183
TIPPERARY.							
Clonmel (Glenam)	Miss Grubb	5	1	10	80 T	46·78	227
„ (Bruce Villa)	J. H. Grubb, Esq.	5	1	6	110 T	41·63	209
CLARE.							
Killaloe	Rev. C. Mayne	10	5	0	123 ⅄	40·70	226

DIVISION XXI.—LEINSTER.

WEXFORD.							
Wexford (Reclaimed Lands)	C. W. Palliser, Esq.	10	1	0	1 ⅄	38·04	137
New Ross (Rosbercon Cas.)	A. E. Graves, Esq.	6	2	6	45 T	37·73	137
Enniscorthy (Ballyhyland)	J. Moffat, Esq.	5	1	0	420 B	47·41	225
Gorey (Courtown)	Earl of Courtown	5	3	0	80 ?	34·57	177
KILKENNY.							
New Ross (Tullogher)	D. A. Milward, Esq.	5	1	0	500 ⅄	52·02	225
Inistioge (Woodstock)	Rt. Hon. W. F. Tighe	5	4	6	400 T	46·25	188
ℬ𝔄*Stoneyford (Inisnag)	Rev. J. Graves	5	1	0	220 ⅄	32·46	203
CARLOW.							
Bagnalstown (Fenagh)	D. W. P. Beresford, Esq.	5	1	5	340 ⅄	33·88	202
Carlow (Browne's Hill)	R. C. Browne, Jun., Esq.	5	1	0	291 ⅄	33·10	214

DIVISION XXI.—LEINSTER—(*continued.*)

STATION.	AUTHORITIES.	Rain Gauge. Diameter	Height Above Ground. ft.	in.	Height Above Sea level feet.	Depth of Rain. 1871. inches.	Days on which '01 or more fell
QUEEN'S COUNTY.							
Portarlington	Dr. Hanlon	5	1	2	240 L	28·51	250
KING'S COUNTY.							
Rathangan (Clonbrin)	Mrs. Gresson	5	1	3	224 T	30·23	...
Tullamore	H. J. B. Kane, Esq.	10	3	0	235	29·09	194
WICKLOW.							
Tinahely (Coollattine Park)	Mr. Byrne	5	1	0	427	35·23	119
Bray (Fassaroe)	E. Barrington, Esq.	10	5	0	250	33·25	173
DUBLIN.							
Black Rock (Rockville)	T. Bewley, Esq.	12	29	0	90 ⅄	28·11	111
Dundrum (Bloomsbury)	J. Wensley Bond, Esq.	5	1	0	268 ⅄	29·37	...
Monkstown (Easton Lodge)	Greenwood Pim, Esq.	3	0	10	70 ?	25·54	168
Dublin (FitzWilliam Square)	Dr. J. W. Moore	5	3	6	57	25·37	191
„ O. S. O. (Castleknock)	Capt. Wilkinson, R.E.	31	10	0	170 ⅄	26·94	176
Glasnevin (Botanic Gardens)	D. Moore, Esq.	36	10	0	65 ⅄	25·06	157
Balbriggan (*daily*)	Rev. S. P. Warren	5	1	0	40 ?	31·51	206
„ (*monthly*)	„ „ „	5	1	0	40 ?	30·19	...
WESTMEATH.							
Athlone (Twyford)	J. Wensley Bond, Esq.	5	1	0	201 T	36·86	266

DIVISION XXII.—CONNAUGHT.

GALWAY.							
Gort (Cregg Park)	R. J. Lattey, Esq.	5	3	0	130 ⅄	36·84	181
Galway (Queen's College)	Prof. Curtis, LL.D.	16	8	2	30 ⅄	39·69	231
BA Ballinasloe	W. H. Kempster, Esq.	5	0	6	150 ?	35·78	242
Tuam (Gardenfield)	H. Kirwan, Esq.	5	6	0	136 T	35·70	...
ROSCOMMON.							
BA* Holywell	H. Smyth, Esq.	5	5	6	...	33·62	177
SLIGO.							
BA* Buninnadden (Doo Castle)	Mr. D. O'Dowd	5	1	0	...	40·84	...
Sligo (Mount Shannon)	F. M. Olpherts, Esq.	9	4	5	70	38·50	203

DIVISION XXIII.—ULSTER.

CAVAN.							
*Belturbet (Red Hills)	Rev. E. Whyte Venables	5	0	9	208	36·04	217
FERMANAGH.							
Enniskillen (Florence Court)	Earl of Enniskillen F.R.S.	12	11	0	300	46·29	215
ARMAGH.							
Armagh Observatory	Rev. Dr. Robinson F.R.S.	10	1	5	208 ⅄	28·40	176

DIVISION XXIII.—ULSTER—(*continued*).

STATION.	AUTHORITIES.	Rain Gauge.				Depth of Rain.	Days on which 01 or more fell
		Diameter	Height Above Ground.		Height Above Sea level	1871.	
			ft.	in.	feet.	inches.	
DOWN.							
Seaforde	Colonel Forde, M.P....	8	0	5	180 T	34·17	185
Milltown (Bann Res)	J. Smyth, Esq. C.E. ...	8	1	0	440 T	43·00	110
Banbridge (Milltown)	" " " ...	8	0	8	200 T	29·77	197
" "	" " " ...	12	40	0	220 T	25·40	...
Waringstown	Capt. Waring	8	0	4	190 T	30·28	190
Sydenham (Alma House)	R. Reade, Esq.	5	1	1	60	32·95	215
ANTRIM.							
Lisburn (Aghalee)	Lancelot Turtle, Esq...	5	1	0	105 T	30·18	176
" "	" "	9	1	0	105 T	29·94	176
†Belfast (Queen's College)	Mr. W. Taylor	11	7	4	68 T	31·91	170
" (Old Park)	W. Girdwood, Esq.....	6	4	0	224 T	40·89	195
" (Antrim Road)	G. Thompson, Esq.....	2	7	3	144 T	28·59	138
BA Carrickfergus	A. Sutherland, Esq. ...	5	1	0	18 L	35·05	187
BA*Antrim (The Manse)	Rev. J. H. Orr	5	1	0	150 T	32·73	171
Cushendun (Agolah)	Rev. S. A. Brenan.....	10	2	6	100 T	24·17	...
LONDONDERRY.							
*Garvagh (Moneydig)	H. R. Morrison, Esq...	5	1	0	121 T	38·31	188
Londonderry	D. Watt, Esq.	8	0	6	80	37·18	...
Bellarena	SirF.Heygate,Bt.,M.P.	5	1	0	12	34·21	194
TYRONE.							
Omagh (Edenfell)	Captain Buchanan.....	8	1	0	280 T	31·43	239
" "	" "	5	1	0	300 T	23·32	...
Strabane (Leckpatrick)	Rev. C. Maxwell	8	0	5	253 T	37·33	239
DONEGAL.							
BA*Letterkenny (Glendoen)	Rev. Dr. Kingsmill ...	5	1	8	108 T	52·63	...
Dunglow (Templecrone)	Rev. A. Delap	8	0	6	10	43·65	236
Moville	Rev. F. Smith	12	4	0	100 T	41·13	219

G. J. S.

SUPPLEMENTARY TABLE OF IMPERFECT RETURNS, COMPLETED BY DIFFERENTIATION FROM ADJACENT STATIONS.

	DIV.	COUNTY.	STATION.	OBSERVER.	Rain Gauge.			Depth of Rain.
					Diameter.	Height Above Ground	Height Above Sea Level	1871
						ft. in.	feet.	inches.
England ...	IV.	Essex.....	Walthamstow	W. R. Birt, Esq.	5	1 5	70 T	22·61
,,	V.	Somerset	Langport (Long Sutton)	R. W. Fry, Esq.	...	0 8	50	28·22
,,	VII.	Derby	Buxton (Poole's Cavern)	E. J. Sykes, Esq.....	8	5 0	1085	49·23
,,	VIII.	Lancaster	Melling (Hornby Castle)	Mr. Reid	12	3 3	100	38·91
,,	IX.	York, E. R.	Thorganby (Thicket Priory).....	Miss M. C. D. Jefferson ...	6	1 4	26 B	24·13
,,	X.	Northumberland.	Morpeth (Meldon Park)	Rev. R. F. Wheeler	5	0 10	...	29·31
,,	,,	Westmoreland ...	Loughrigg Fell	E. B. W. Balme, Esq. ...	8	1 0	1000	70·75
Wales	XI.	Glamorgan	Aberdare (Ty-mawr)	E. Jones, Esq.	5	1 6	425 M	61·34
,,	,,	Pembroke	Milford (St. Anne's)	T. L. Marriott, Esq.	8	0 8	135	37·54
Scotland ...	XII.	Dumfries	Wanlockhead	Mr. G. Dawson	3	0 4	1330	59·74
,,	XV.	Stirling.....	Ben Lomond	Glasgow Water Works ...	...	...	1800	76·78
,,	XVI.	Fife	Cupar (District Asylum)	A. Buchan, Esq.	5	0 5	210	27·23
,,	XVII.	Aberdeen	Cluny	,, ,, ,, ...	5	...	280	25·82
,,	XIX.	Sutherland	House of Tongue.....	,, ,, ,, ...	...	...	...	22·90
Ireland.....	XX.	Cork	Fermoy (Glenville)	H. Hudson, Esq., M.D. ...	8	1 0	514 M	54·20

FINANCIAL.

THE usual circular to my correspondents, issued in December last, concluded with the following paragraph :—

"One word as to subscriptions, &c. I thankfully acknowledge the assistance whereby I have been enabled to raise the system of rainfall observation to its present unequalled position, but I should very much prefer that its maintenance did not depend on the frail thread of one man's life. To secure this, (1) a successor must be trained, and (2) there must be a probability of his being remunerated. Leaving the second condition to the future, I merely now desire to state that if my correspondents concur in the desirability of this object, and are inclined slightly to increase their subscriptions, I will appropriate the excess to the payment of a permanent assistant, who would then become thoroughly accustomed to the work, while relieving me from much routine copying, and thereby enabling me to prosecute its more difficult branches."

The appositeness of these remarks, written nearly six months since, is rather remarkable, as nothing at all similar in tenour had ever fallen from my pen, and never before has there been such a risk of my being prevented continuing the work.

I am sorry to say that the proposal has not met with the response which I expected, and which, I venture to think, it deserves. The sum received for this object is only just over £20, while the first year's expenditure, including fitting up the assistant's office, will probably be at least thrice that sum.

The general subscriptions, which alone enable me to meet the very heavy expenses of our developed organization, remain nearly stationary both in amount and in number, thereby threatening a return to the days when, as a reviewer kindly said, "Mr. Symons is doing good work : it is not well that he should pay thus heavily for the privilege of doing it."

No one could be more sensible than I am of the kindness and con-

fidence of my correspondents in subscribing the sums noted below, and thereby enabling me to carry on this work, or more reluctant than I am even to think of checking its steady development; but I must be guided by the funds at my disposal, and they are, at present, insufficient to justify my undertaking the discussion of several questions which ought to be worked out.

List of all Sums of £1 and upwards, received in payment for Books, Diagrams, &c., or as contributions to the general expenses of Rainfall investigations in 1872.

	£	s.	d.
Abbotts, R. W., Esq.	1	10	0
Alexander, J., Esq.	1	0	0
Andersson, A. R., Esq.	2	5	0
Appach, R., Esq.	1	0	0
Assheton, R., Esq., M.P.	1	0	0
Atkinson, A., Esq.	1	1	0
Backhouse, C. J., Esq.	1	5	0
Backhouse, T. W., Esq.	1	5	0
Baker, W. C., Esq.	1	1	0
Balme, E. B. W., Esq.	2	0	0
Barrington, E., Esq.	1	0	0
Bathurst, Rev. W. H.	1	0	0
Bayning, The Lady	1	1	0
Bell, T., Esq.	1	1	0
Bellamy, G. D., Esq.	1	0	0
Berens, Miss (2 years)	2	2	0
Bewley, T., Esq.	1	0	0
Bicknell, P., Esq.	2	0	0
Bigge, Rev. J. F. (2 years)	1	0	0
Birkbeck, W., Esq.	1	0	0
Billson, R. Esq.	1	0	0
Blake, W., Esq	1	0	0
Blomfield, Rev. L.	1	0	0
Bolckow, H. W. F., Esq., M.P.	1	10	0
Bond, J. W., Esq	1	1	0
Bosanquet, S., Esq.	1	0	0
Box, A. M., Esq.	1	17	6
Bravender, J., Esq.	1	5	0
Bridgeman, Hon. & Rev. J.R.O.	1	5	0
Bridport, Right Hon. Viscount	1	0	0
Bridson, H., Esq	1	5	0
Brooke, The Rev. J.	1	10	0
Brown, A. J. D., Esq.	1	0	0
Brown, Rev. D.	1	10	0
Bumpstead, The Rev. T. J.	1	0	0
Burder, Dr. G. F	1	0	0
Burlingham, R., Esq.	1	11	6
Burra, J. S., Esq.	1	5	0
Bushell, R., Esq.	2	0	0
Campbell, A., Esq.	1	0	0
Campbell, Colin, Esq.	1	0	0
Cator, C. O. F., Esq.	1	10	0
Cathcart, E., Esq.	1	10	0
Chapman, E. Esq.	1	2	6
Charrington, F., Esq.	1	0	0
Chrimes, R., Esq.	10	0	0
Clarke, E., Esq	1	0	0
Clegram, W. B., Esq., C.E.	1	10	0
Cockayne, H. E., Esq	1	0	0
Collins, C. R., Esq. (2 years)	1	16	0
Coode, W., Esq.	1	1	0
Cooke, The Rev. R. B.	1	0	0
Cooke, J. H., Esq.	1	0	0
Darby, C., Esq.	1	15	0
Davis, J., Esq.	1	0	0
Davis, T. H., Esq.	1	1	0
Davis, Rev. R. P.	1	2	0
Denne, W., Esq.	1	1	0
Dines, G., Esq.	1	0	0
Dipple, G., Esq.	1	0	0
Divett, J., Esq.	1	0	0
Dixon, Dr.	1	0	0
Dod, Whitehall, Esq.	1	10	0
Douglas, S., Esq.	1	0	0
Drummond, General	2	0	0
Dyke, T. J., Esq. (2 years)	1	7	0
Dymond, E. E., Esq.	1	1	0
Ellis, W. H., Esq.	1	1	0
Ellis, Captain Fairford, R.A.	1	0	0
Erskine, Sir T., Bart.	1	5	0
Evans, F. G., Esq.	1	10	0
Fawcett, E. G., Esq	1	0	0
Fawcett, H., Esq.	1	1	0
Fenwick, T., Esq., C.E.	1	1	0
Ffolkes, The Rev. H.	1	0	0
Field, Rogers, Esq., C.E.	1	11	0
Filliter, E., Esq., C.E.	1	11	0
Finlay, J., Esq.	1	10	0
Forde, Colonel, M.P.	2	5	0
Foster, R., Esq	1	0	0
Fothergill, Rev. H. J. A.	1	5	0
Freeman, D. A., Esq.	1	10	0
Gale, J. M., Esq., C.E.	1	0	0
Gamlen, W. H., Esq.	1	3	0
Garnett, W., Esq.	1	14	0
Giles, J., Esq.	1	5	0

	£	s.	d.
Gillow, Rev. Dr.	1	0	0
Gosset, The Rev. I. H.	1	14	0
Gott, C., Esq.	1	1	0
Graham, Mrs.	1	5	0
Gulson, J., Esq.	1	6	0
Hankinson, R. C., Esq.	1	1	0
Harcourt, Colonel	1	0	0
Hare, C. K., Esq.	1	0	0
Harris, W. J., Esq.	2	10	0
Harrison, W. F., Esq.	2	12	0
Haywood, A. H., Esq.	1	13	0
Healey, G., Esq.	1	5	0
Heberden, Rev. W.	1	0	0
Herbert, J. M., Esq.	1	0	0
Hill, The Rev. E.	1	10	0
Hill, J. H., Esq.	2	0	0
Hirst, J., Jun., Esq.	1	10	0
Holdsworth, J. S., Esq.	1	0	0
Hopkins, Rev. T.	1	17	0
Horncastle, H., Esq.	1	0	0
Horner, Rev. J.	3	0	0
Hoskins, T. A., Esq.	1	0	0
Howard, W. D., Esq.	5	10	0
Howman, The Rev. E. J.	1	10	0
Hubbard, Egerton, Esq.	1	10	0
Hudson, H., Esq., M.D.	1	0	0
Hull, The Rev. J.	1	0	0
Ingram, The Rev. H.	2	5	0
Jarvis, R. F. Esq.	1	0	0
Jefferson, Miss M. C. D.	1	0	0
Jones, Mrs.	1	0	0
Jowers, F. W. E., Esq.	1	6	0
Karslake, The Rev. W. H.	1	0	0
Ker, R., Esq.	1	1	0
Knott, J., Esq.	1	10	0
Knowles, J., Esq.	1	0	0
Langton, S. Z., Esq.	1	0	0
Leather, J. T., Esq., C.E.	2	0	0
Legard, the Hon. Lady	2	0	0
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